

CHAPTER 6

CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL DECONTAMINATION

The presence of contamination can greatly reduce the effectiveness of the combat forces. Contamination forces personnel to wear protective equipment that degrades their ability to conduct individual and collective tasks. Therefore, an understanding of the behavior and characteristics of contamination enables personnel to better direct their efforts in taking countermeasures to avoid or reduce a nuclear, a biological, and a chemical hazard. Consideration of these factors will help the individual Seabee, planner, and leader in the integration of CBR defensive measures in tactical operations.

Companies in a battalion are required to have at least one six-man team trained to perform decon operations. Obtaining the required skills through training at the 20th NCR or 31st NCR is strongly encouraged to become decon qualified. Therefore, this chapter is only designed to familiarize the reader with decon operations and decon terms.

NOTE: Nuclear, biological, and chemical warfare (NBC) and chemical, biological, and radiological warfare (CBR) are similar. Army field manuals (FMs) and Marine Corps field manuals (FMFMs) refer to CBR as NBC; therefore, when this chapter refers to CBR, it is also referring to NBC.

FORMS OF CONTAMINATION

Successful decontamination (decon) requires that you understand the forms of contamination and what makes it dangerous. The different origins and forms of contamination cause different hazards. A brief discussion of the major forms and origins of contamination will clarify the meaning of contamination, as it is used in this chapter.

SOLIDS

Chemical agents, biological agents, and radiological contamination can all take solid forms. Often, they appear as fine dust. The dust could take the form of radioactive dirt (fallout), a frozen chemical mist, or a dust pollinated with biological toxins and/or biological spores. Another form is a powder, coated with chemical/biological agents (for example, dusty mustard).

LIQUIDS

Liquid contamination is generally delivered in a mist, a vapor, or rain that falls to the ground. Liquid contamination can be made thick, like syrup or gelatin. It sticks to what it touches and evaporates slowly. Low vapor pressure and high viscosity make it difficult to decontaminate. Chemical, biological, and nuclear contaminants, when mixed with rain, can contaminate large areas. When the "washout" evaporates, the solid or liquid contamination may remain for some time.

GASES

Chemical contaminants give off vapors. Toxic chemical agents, delivered as a gas cloud, are used either directly on the target or upwind of the target. Depending on the weather conditions, wind currents can spread toxic gas clouds over a large area. Most toxic gases disperse or evaporate quite readily. However, surfaces, contaminated with liquid chemical agents, may give off toxic gases for days.

TYPES OF CONTAMINATION HAZARDS

If you understand the contamination hazards (transfer, spread, vapor, desorption, and radiation), you will understand contamination characteristics. This will help you to understand the importance of decon in successfully completing your mission under CBR conditions.

TRANSFER

Anything that touches a surface covered with liquid or solid contamination will tend to pick up that contamination and move it from one surface to another. You must eliminate or limit contamination transfer into clean areas. For example, troops, climbing in and out of a contaminated vehicle, can transfer agents to the inside of the vehicle. This activity results in two hazards: inhaling the gas given off by the agent brought into the vehicle and physical contact with the agent brought into the vehicle.

SPREAD

Touching a surface covered with a liquid chemical agent can spread contamination on the same surface, thus increasing the size of the contaminated area. When this condition occurs, more decontaminates along with more of an effort will be spent deconing. Therefore, limit the spread of contamination to a clean surface by decontaminating it with a designated decontaminate and/or the appropriate equipment.

VAPOR

A vapor hazard includes any contamination you can breathe, no matter what form it takes, such as dust in the air, atomized liquids (aerosols), or true gases. Generally, vapors in an open/outdoor area disperse rapidly so you do not need to decontaminate them. However, some agent vapors, such as atomized blister, create a transfer hazard because they settle from the air and coat the surfaces they touch. Since solid or liquid contamination remains on a surface, it can continually generate new vapors. Liquid contamination, mixed with dust, can result in a vapor hazard due to wind or movement of vehicles. Generally, when a transfer or spread hazard exists, a vapor hazard could also exist.

DESORPTION

Liquid chemical contamination quickly absorbs into porous surfaces. Once absorbed, it begins to desorb or give off gas; that is, low levels of vapor pass out of the contaminated surface into the air and can be transferred to any surface that contacts it, including bare skin. For example, if you were operating a vehicle that was desorbing a nerve agent, you should protect yourself by wearing, as a minimum, your protective mask and gloves. Exposure to the desorbing nerve agent might blur your vision or interfere with your ability to think clearly. Handling a steering wheel bare-handed when it is desorbing nerve agent may also cause acute nerve agent poisoning. Prevent desorption by decontaminating quickly before any agent can be absorbed into the surface. Surfaces, protected with a chemical agent resistant coating (CARC) that consists of a polyurethane paint coating, can prevent agent absorption. These surfaces can be easily decontaminated with soap and hot water or DS2.

RADIATION

The penetrating energy of radiation does not directly fall into any of the previous categories. Radiation is given off by radioactive dust or dirt, most of which appears as fallout. For decon purposes, radiation can be thought of as a solid. Radioactive contamination can usually be removed by brushing, wiping, or shaking. Decontaminate quickly to decrease the cumulative effects of radiation; otherwise, small but frequent exposure to radiation may cause radiation sickness.

PERSISTENCY

The length of time a hazard remains depends on the "persistency" of the contamination. A full discussion of detection and hazard prediction for all types of contamination is given in Army manuals FM 3-3 and FM 3-3-1.

CHEMICAL

Nonpersistent contamination generally requires no decon. However, the duration and effectiveness of chemical agents used on the battlefield will depend on a series of factors that affect agent persistency. Some of these factors are as follows:

- Type of contamination
- Contamination density and droplet size
- Temperature
- Wind speed
- Sunlight
- Humidity and rain
- Composition of the contaminated surface
- Type of soil and terrain

Any contamination found on your skin must be decontaminated immediately, regardless of persistency. Some contamination hazards can affect you within minutes after touching your skin (an agent like CX will affect you within seconds). After you conduct skin decon, use detection equipment to determine the type of contamination. This will help to decide whether additional decon and/or treatment is required.

Changes to the physical behavior of chemical agents can be caused by changes in weather conditions. For example, in cold weather, nonpersistent agents tend to become semipersistent, lasting from 2 to 10 days. Refer to FM 3-6, *Field Behavior of NBC Agents*, for detailed information.

BIOLOGICAL

The many variables, involved in estimating persistency of biological hazards, require separate consideration for each instance of contamination. Specially trained medical personnel will consider specific treatment direction only after the contamination has been specifically identified. For example, biological agents will persist longer in cold weather. Temperate inversions (stable conditions) that exist over snowfields also tend to prolong the stay of an aerosolized biological cloud.

RADIOLOGICAL

A general idea of the persistency of radiological hazards can be gained by taking radiation dose readings. At this time, the NCF uses two types of radioactive detection and computation (RADIAC) instruments:

1. The AN/PDR-27 instrument provides radioactivity detection in the lower ranges. It is designed to detect beta radiation and measure and detect gamma nuclear radiation. The AN/PDR-27 is also used to monitor low level radiation contamination on personnel, supplies, and equipment.

2. AN/PDR-43 instrument provides detection of radioactivity in the high range. It is designed to detect beta radiation and measure and detect gamma nuclear radiation.

NOTE: Only qualified personnel are authorized to operate RADIAC instruments.

For operational purposes, you can use the “7-10 rule of thumb” to estimate future radiation levels. **This rule provides a general estimate and should be used for planning only.** The rate of radioactive decay is proportional over time. The 7-10 rule means that for seven multiples of time after the burst, the radiation intensity will decrease by a factor of 10. For example, if 2 hours after the burst your radiation reading is

100 Centigray (cGy) (rad) per hour, then 14 hours after the burst (7 times 2 hours), you can expect a reading of about 10 cGy (100 cGy divided by 10). Radiation contamination is not affected by climatic conditions or other variables that affect chemical contamination. The Army manual, FM 3-3-1, describes radiation decay rates in detail.

NEGLECTIBLE RISK

You must consider decon if the levels of contamination exceed negligible risk levels.

BIOLOGICAL AND CHEMICAL

Negligible risk levels for biological and chemical contamination are contamination that will cause mild incapacitation among no more than 5 percent of unprotected troops operating for 12 continuous hours within 1 meter of contaminated surfaces. Measurements that determine safe levels are made with detection equipment held 1 inch away from the surface. For example, a one bar reading displayed on the chemical agent monitor (CAM) indicates a reduced hazard level that should be considered as a negligible risk level.

RADIOLOGICAL

Negligible risk levels for radiological contamination are measurements of 0.33 centigray (cGy) or less. This level of radiation will cause no more than 2.5 percent mild incapacitation to unprotected troops.

CONTAMINATION COMBINATIONS

Simultaneous enemy CBR attacks will probably be part of the strategy of the enemy. Risk assessments include consideration that the enemy may use combinations of nuclear, biological, and chemical weapons or may use any of these combined with conventional fire. Once CBR weapons have been introduced on the battlefield, the enemy may try to deceive you regarding the type of hazard.

The thermal effects of a nuclear blast might destroy the effects of any chemical or biological

weapons used simultaneously. However, chemical or biological weapons effectiveness is increased if used following a nuclear attack. Nuclear blast casualties and psychologically stressed troops are vulnerable to a CBR agent attack. Agents could enter collective protective shelters, communication facilities, and vehicles damaged by the nuclear detonation.

When CBR contamination hazards exist, **decontaminate the chemical agents first**. Chemical agents are normally the most lethal and fastest acting type of contamination. The decon methods for chemical agents are also effective for neutralizing or removing biological and radiological contamination. The reverse is not true.

The enemy may use a mixture of agents in their munitions to cause multiple types of contamination. Such mixtures could be used to achieve the following various purposes:

1. Lower the freezing point of the agents and increase agent persistency, such as mustard lewisite mixture.
2. Create both percutaneous (through the skin) and inhalation hazards, such as thickened GD and GB.
3. Complicate agent identification of mixed agents, making treatment of casualties more difficult.
4. Combine agents with both immediate and long-term persistency, such as anthrax, with an incubation period of 1 to 5 days and histoplasmosis (pulmonary infection disease) with an incubation period of 5 to 18 days.

There is no field detecting system that can detect or identify biological agents. Therefore, combinations of biological and chemical contaminants present a different challenge. This challenge can be dealt with if standard chemical decon measures are followed at once. Use standard chemical decontaminants when combinations are known or suspected to exist. They can be used for toxins and biological agents as well as chemical agents. See appendix IV for a description of field expedient chemical decontaminants for use against these hazards.

Do not base decon measures solely upon the first hazard identified. Make sure you check thoroughly to identify all agent hazards. When specific agents are detected, take appropriate decon measures.

REASONS FOR DECON

You must have a good idea of the reasons for decon and the types/techniques of decon. You must assess your tactical situation and consider your decon resources within the context of mission, enemy, terrain, troops, and time available (METT-T). You must know the principles of decon and know how decon affects your combat power. Protective clothing and equipment (MOPP gear) and collective protection shelters offer only a temporary solution. Decon is a more permanent solution because it includes the removal, the destruction, or the neutralization of contamination. When you have become contaminated, there are practical reasons why at least some decon must occur as soon as possible. You must use these decon concepts in selecting the best action to take to accomplish your mission.

Decon should be considered within the context of METT-T and resources available. The four factors that must be addressed before you decide to decontaminate are as follows:

- Lethality
- Performance degradation
- Equipment limitations
- Transfer and spread

LETHALITY

Some types of contamination are so toxic they can kill or incapacitate if they contact exposed skin for a few minutes. If your skin becomes contaminated, you must stop breathing, mask, give the alarm, and decontaminate your skin immediately. Periodically, observe for nerve agent symptoms if the agent type is unknown.

PERFORMANCE DEGRADATION

MOPP (mission-oriented protective posture) gear provides protection but also degrades performance. The longer you are in MOPP 4, the lower your efficiency. Using tools and weapons while wearing the protective gloves is awkward. The mask reduces your field of view, making it difficult to use some optical sights and night vision devices. Extended

operations in MOPP gear tire and discourage troops. Troops cannot eat while wearing a mask. Urinating and defecating are potentially dangerous in a contaminated area. Even resting and sleeping are difficult because it is hard to breathe through the mask. Hot or humid climates compound these problems because the mask makes breathing more difficult.

EQUIPMENT LIMITATIONS

MOPP gear provides protection from chemical and biological agent attacks, but some limitations can reduce its effectiveness. Agents can gradually penetrate the mask hood. However, the protective qualities of the hood can be extended many hours if the chemical agent is removed or decontaminated quickly before it penetrates the hood.

Two primary types of chemical protective overgarments are in use at this time with different protection. The first is the chemical protective overgarment (CPO) that is currently in the TOA of each battalion. In an uncontaminated environment, the CPO is good for 140 hours within 30 days after the initial opening of the original protective package and subject to the following conditions:

- When not worn, store in a sealed plastic bag.
- The 140 hours is only applicable to wear time. The clock stops while the overgarment is stored in a plastic bag.
- Overgarments that have come into contact with POLs must be replaced.

In a **contaminated** environment, 6 hours of protection is provided and the CPO is subject to the following:

1. Once in a contaminated environment, the 6-hour criteria vice 140-hour criteria becomes the controlling parameter. If chemical liquid contamination remains after 6 hours, MOPP gear exchange must be conducted as soon as possible. "MOPP Gear Exchange" will be discussed further on in this chapter.

2. If cumulative wear time is 138 hours and the environment becomes contaminated, the suit may be worn an additional 6 hours for a maximum cumulative wear time of 144 hours.

The second type of overgarment that is currently not in the TOA is the battle dress overgarment (BDO). It provides protection for 24 hours after becoming contaminated with liquid chemical agents.

Troop performance will decrease over time while they are in full MOPP; therefore, risk assessment must be conducted before executing a task or mission. For example, you should know that the following critical areas or tasks are degraded:

- Navigation and terrain orientation
- Target acquisition
- The decision-making process (leader fatigue)
- Communications
- Fire support coordination
- Maneuver formations/convoy operations

Unit commanders, conducting extended operations in full MOPP gear, weigh the risk of whether or not to conduct decon. The unit commander must consider the capabilities and limitations of the unit while performing in MOPP during different types of conditions. Refer to the *Seabee Combat Handbook*, volume 1, chapter 19.

A contamination hazard will be reduced by conducting hasty decon and exchange of the MOPP gear. This action also provides temporary relief from MOPP and the reduction of risk during combat operations. The commander considers the time and the resources needed to conduct decon versus the degradation caused by operating in full MOPP gear. The commander also understands that before ordering the removal of protective masks, they must move their unit to a clean area and conduct unmasking procedures. After hasty decon (MOPP gear exchange and vehicle wash down), the Seabee's risk is reduced by the following:

1. Decreasing the time personnel are exposed to chemical agents.
2. Providing temporary relief from full MOPP. This aids in increasing survivability of the unit on the battlefield because the MOPP encapsulation causes limitations that may result in conventional casualties (for example, heat stress in combat).
3. Decreasing the risk of transfer and spreading of contamination.

MOPP gear provides little direct protection from the hazards of radiological (rad) contamination, such as the radiation from fallout. But commanders may often decide to use MOPP gear for its indirect advantages. MOPP 4 can prevent the inhalation of

radioactive particles, keep contamination off the skin, and greatly simplify decon. Although the danger from fallout is not immediate, the radiation may gradually build up to a dangerous level. Therefore, the contamination must be removed when the mission allows. The protective mask filter elements will need to be replaced because of radioactive particle buildup.

TRANSFER AND SPREAD

You must avoid contamination as much as possible. Once a unit becomes contaminated with a chemical agent, quick or rapid decon is critical to prevent further spread or transfer of contamination onto a clean area or surface. Rapid decon may allow the unit to be in the lowest MOPP level possible and preserve its combat power.

PRINCIPLES OF DECONTAMINATION

The resources of manpower, time, and material are critical for your decision on how to sustain combat operations. Two concepts must be considered: the use of these resources and the ability to sustain combat operations. You must know when, where, what, and how to perform decon by following the four principles discussed in the following paragraphs.

First, decontaminate as soon as possible. This is the most important principle of the four. Consider this principle before you consider any other. Contamination hazards force you into higher levels of MOPP and immediately begin to degrade the ability to perform your mission. The sooner the contamination is removed, the sooner you can reduce MOPP levels.

Second, decontaminate only what is necessary. You cannot waste precious resources decontaminating everything. Decontaminate only what is necessary to continue your mission. Consider the following factors when you decide whether decon will interfere with the mission:

- Mission—"tempo of battle"
- Time available
- Degree of contamination
- Length of time you have been in MOPP 4
- Decon assets available

Third, decontaminate as far forward as possible (limit spread). Do not transport contaminated personnel and equipment away from your operational area if you can bring decon assets forward safely. This will keep your equipment on location where it is needed, allow decon to begin earlier, and limit the spread of contamination to other areas.

Fourth, decontaminate by priority. Clean important items of equipment first and the least important items last. The COC will prioritize the equipment for decontamination.

LEVELS OF DECONTAMINATION

Three levels of decon are used today: immediate, operational, and thorough. All three levels (fig. 6-1) are discussed in this chapter.

IMMEDIATE DECON

The aim of immediate decon is to minimize casualties, save lives, and limit the spread of contamination. Immediate decon is carried out by individuals upon becoming contaminated. Three immediate decon techniques are used today:

- Skin decon
- Personal wipe down
- Operator's spray down

OPERATIONAL DECON

The aim of operational decon is to sustain operations, reduce the contact hazard, and limit the spread of contamination. Operational decon will also eliminate the necessity or reduce the duration of wearing MOPP gear. Operational decon is done by individuals and/or units. It is restricted to specific parts of operationally essential equipment, material, and/or working areas. Operational decon minimizes contact and transfer hazards. Further decon may be required to reduce contamination to negligible risk levels. Two operational decon techniques are used today:

- Vehicle wash down
- MOPP gear exchange

THOROUGH DECON

The aim of thorough decon is to reduce or eliminate the need for individual protective clothing. Thorough decon is carried out to reduce

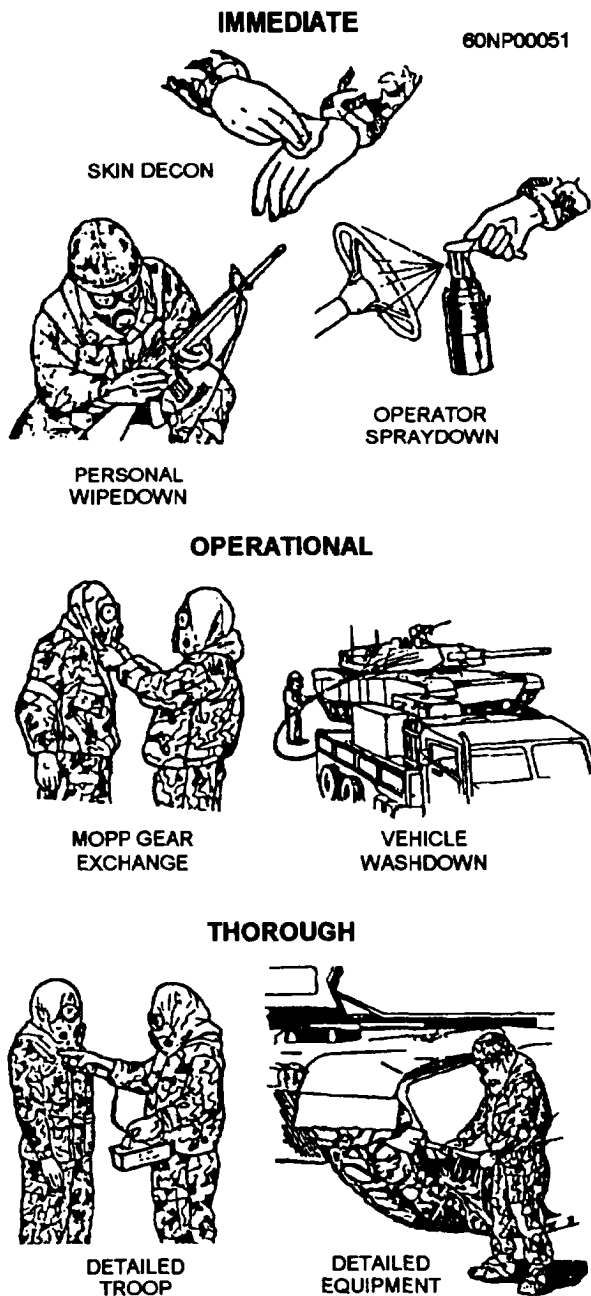


Figure 6-1.—Decon techniques.

contamination on personnel, equipment/material, and/or working areas to the lowest possible level (negligible risk). This permits the reduction or removal of individual protective equipment and maintains operations with the least degradation. Thorough decon reduces CBR contamination levels to a negligible risk. There are two thorough decon techniques that Seabees use:

- Detailed troop decon (DTD)
- Detailed equipment decon (DED)

We now know that contamination causes casualties and restricts the use of equipment and terrain. Decontamination reduces or eliminates the hazard and permits units to continue their mission. We also know the three levels of decontamination. We will now discuss decontamination operations for each level of decontamination.

IMMEDIATE DECON OPERATIONS

Immediate decon techniques are initiated by the individual Seabee, without command, once he or she is aware they have contamination on their bare skin. The individual Seabee uses his or her personal M291 or M258A1 skin decon kit to decontaminate exposed skin. Next, they decontaminate their MOPP gear and weapon, using the M280DKIE (decon kit, individual equipment) or with an additional M291/M258A1 kit. Use these items for chemical and biological contamination removal only.

Radiological contamination hazards affect you differently, but the principle is the same. Remove radiological contamination from equipment and personnel by brushing and/or using soap and water, respectively.

SKIN DECONTAMINATION

If chemical agents contact your skin, you must take immediate action to decontaminate yourself. Start the skin decon technique within 1 minute of becoming contaminated. Some toxic chemical agents, especially nerve agents, are rapidly absorbed by the skin and can kill in minutes.

Individual decon kits (IDK), M291 or M258A1 (fig. 6-2), provide the best means of skin decon. Instructions and procedures are on the outside of the kit.

The solutions in the M258A1 kit are caustic. Keep them out of the eyes, nose, wounds, and mouth. Use water to wash toxic agent or decon solution out of the eyes or wounds and seek medical treatment. Familiarize yourself with the operating instructions for both kits because of the differences in the M258A1 and M291 kits. The M258A1 uses a moist towelette with a decon solution, whereas the M291 uses a powder. Although you cannot see liquid contamination in the dark, you must be prepared to decontaminate during darkness. The M258A1 wipe 1 packet has an identifying tab that you can feel in the dark.

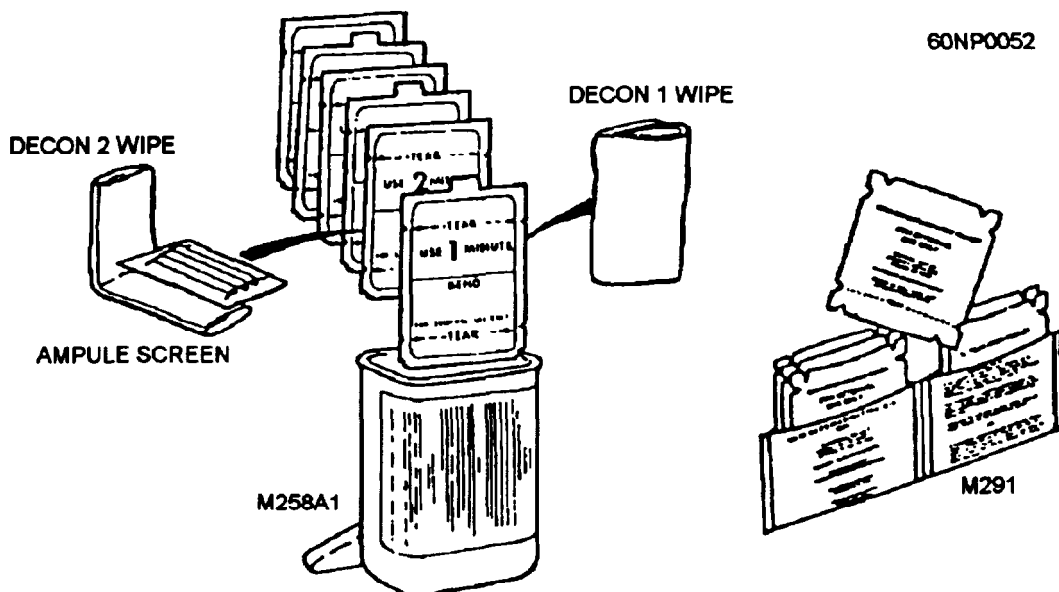


Figure 6-2.—Skin decontamination kits.

WARNING

Solutions in the M258A1 decon kit are flammable and unstable in storage at temperatures above 110°F (43°C) or for long periods in sunlight. Also, protect it from freezing temperatures. Used at 32°F (0°C) or below, the solution may cause frostbite.

If you do not have a skin decon kit, chemical contamination may be pinch-blotted from the skin with a cloth and the area flushed with water from your canteen. Pinch-blotting is better than rubbing because it limits the spread of the contamination. Soap, if available, can also be used to wash the agent from the skin. Washing with soap and water (or hot water) is the next best method for toxic agent decon. This method is not as effective as using the decon kits.

NOTE: The M291 skin decon kit replaces the M258A1 skin decon kit. However, there will still be a time when the two kits are available in the field.

Biological

Currently, no means exists of detecting biological agents. You probably will not know immediately when you have become contaminated. Most biological agents, except toxins, pose their primary threat through inhalation or ingestion. The skin is an effective barrier against most biological agents if it has no cuts or scratches.

Unit corpsmen know the types and levels of natural infection for the area of operations. They monitor these levels. If a given disease reaches a high level, they decide whether or not a deliberate biological attack has occurred.

The best biological defense is to take action before you are attacked. Keep immunizations up-to-date, observe basic sanitary precautions, and keep skin breaks covered. Treat minor cuts or abrasions by ordinary first-aid measures (iodine, Zephiran, or Merthiolate). Washing with soap and water removes nearly all biological agents from the skin. Frequent showering or bathing lessens chances of infection and disease. A 0.5 percent sodium hypochlorite (household bleach) solution is also an effective biological decontaminant. Appendix IV tells how to make this solution.

Radiological

Because no immediate life-threatening hazard is caused by radiological contamination, no immediate skin decon is required. However, wash exposed areas of your skin when possible. If your skin is contaminated by radiological contamination, use operational decon techniques immediately. (See "MOPP Gear Exchange" for a detailed discussion on reducing radiation levels from radiological contamination.)

PERSONAL WIPE DOWN

The personal wipe down technique is most effective when done within 15 minutes of being contaminated. Every Seabee wipes down his or her mask, hood, gloves, and other essential gear. (An exception is when a thickened agent is globed on the overgarment.) For chemical and biological decon, Seabees use their skin decon kits. Radiological contamination may be brushed away.

Do not attempt to remove chemical contamination from your protective overgarment. The special protective properties of the garment minimize hazards from chemical agents. However, brush off radiological, biological, or frozen chemical agent contamination from your overgarment.

If radiological contamination is not removed, your radiation exposure will increase over time.

Chemical

The stocks and handgrips of individual weapons also tend to absorb chemical agents. Once absorbed, they may present a vapor hazard for days. To reduce this penetration and vapor hazard, decontaminate individual equipment using the M291 or the M258A1 kits. You must decontaminate gloves, hood and mask, helmet, and weapon if they are contaminated. Perform personal and equipment wipe down within 15 minutes after being exposed to liquid contamination. Additionally, wearing your Kevlar helmet protective cover will prevent or reduce the absorption of any liquid chemical agent.

If an agent is globed on your overgarment, you may scrape it off with a stick or other object; otherwise, do not attempt to decontaminate chemical agents on your overgarment. This will provide little, if any, extra protection and you probably will not have enough M291 and M258A1 decon wipes to do so.

Decon wipe 1 works better against the G-type of nerve agents but can burn your skin. Decon wipe 2 works better against CX-type of nerve agents and blister agents. Additionally, decon wipe 2 is not as caustic to the skin and should help to neutralize some of the caustic compounds in wipe 1. When M291 and M258A1 decon wipes are not available, field expedient methods, such as washing with soap, water, and bleach solution, are partially effective (see appendix V).

Biological

If you know or suspect toxins or other biological agents are present, remove the contamination with soap and water. If water is not available, use M258A1 decon wipes in the same manner as described for chemical agent decon.

Radiological

Radiological contamination can readily be detected and located with monitoring equipment. Remove the contamination and you reduce the hazard. Brush the dust off your load-bearing equipment and mask carrier. If you are contaminated with a dry contaminant, such as fallout, shake your clothing and gear. Wash the exposed areas of your skin. Use M258A1 decon wipes if soap and water are not available. Pay particular attention to your hair and fingernails. Avoid breathing the dust you shake off by wearing a piece of cloth over your face. If you were contaminated by a wet radiological contaminant, you must immediately conduct a MOPP gear exchange. Brushing or shaking will not remove the wet radiological contaminant or its hazard. Wipe off your mask, hood, helmet, gloves, footwear covers, and other personal equipment with warm, soapy water. If warm, soapy water is unavailable, use rags or damp paper towels. Ensure contamination is not spread to clean areas.

OPERATOR'S SPRAY DOWN

After you have decontaminated yourself and your personal equipment, you may need to decon other mission-essential portions of your equipment before continuing your mission. For example, you may need to decon the vehicle you are operating or a crew-served weapon. To ensure you do not pick up contamination from these items, decontaminate those surfaces you or your crew must touch while operating the equipment. This decon is called the "operator's spray down" and is most effective when done within 15 minutes after personal wipe down. Starting this technique later is not as effective; contamination, especially chemical agents, will probably have spread and will be more difficult to remove by this technique.

Chemical

Decontaminate those surfaces you must touch to do your job. Use an onboard portable decon apparatus, such as M11 or M13 (fig. 6-3).

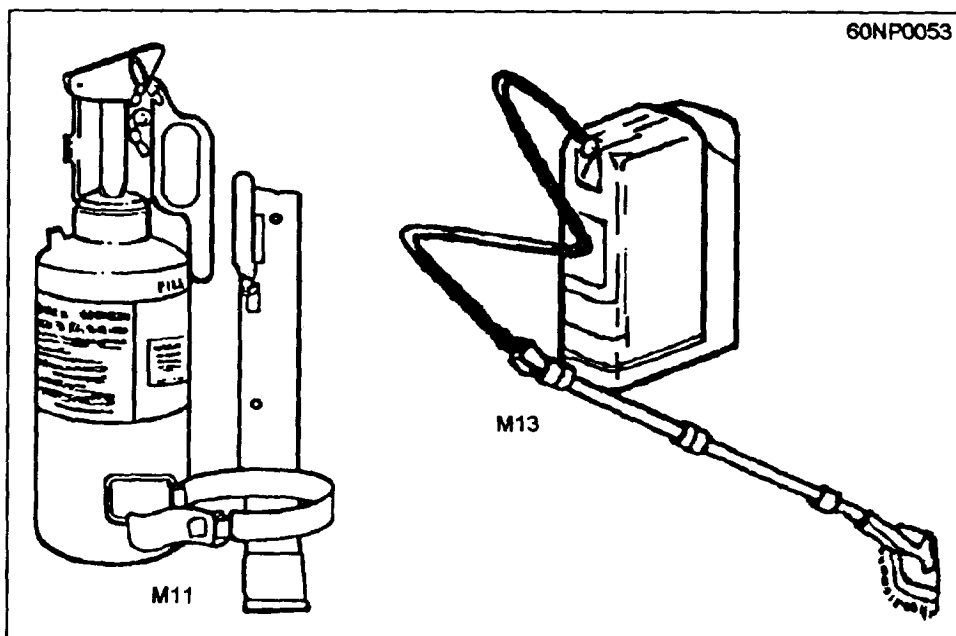


Figure 6-3.—Portable decon apparatus.

Spray DS2 onto those surfaces you must touch to do your mission. Scrub the DS2 into the surface with brushes. Wait 30 minutes, then wash it off. If a decon apparatus is not available, use the field expedient resources available to apply DS2 or supertropical bleach (STB) from the bulk containers. If necessary, use nonstandard decontaminants discussed in appendix IV.

Biological

A bleach solution is the preferred decontaminant for biological contamination; however, if it is not available, use hot, soapy water. Apply the bleach solution with brushes and scrub the surface well. Rinse the surface after scrubbing (a 30-minute wait is not required). DS2 or STB is also effective against most known biological contamination, but because of their caustic nature are not preferred. Other nonstandard biological decontaminants are described in appendix IV.

WARNING

Always use extreme caution when handling DS2.

Some important factors that should be remembered when handling DS2 are as follows:

- Do not mix DS2 and STB because mixing the two will cause a fire.

- DS2 is a combustible solution and should not be sprayed on personnel or protective clothing.
- Severe chemical burns can result if personnel fail to observe all safety precautions.
- DS2 can severely injure eyes and skin and, if inhaled, can cause illness.
- DS2 can damage CBR protective overgarments, protective gloves, hood, and overboots.

Radiological

If you are contaminated by fallout, rain out, neutron-induced contamination, or any type of radiological agent, use your monitoring equipment to help locate contamination. Then decontaminate as required. If detection equipment is not available and you suspect you are contaminated, decontaminate.

Radiological contamination can usually be removed by brushing or scraping (use brooms or tree branches). Water is effective for flushing away radiological contamination. Control the runoff by using drainage ditches that flow into a sump. Remember, you have not destroyed contamination, just moved it. The runoff will still be hazardous. Brushing or scooping away the top inch of soil from your fighting position will also lower the amount of radiological contamination.

OPERATIONAL DECON OPERATIONS

Operational decon generally follows immediate decon. The objective is to reduce the level of contamination to regenerate needed combat power. Therefore, the unit can sustain its mission in a contaminated environment. Operational decon will further reduce the risk of contamination transfer, the spread of contamination, and the speed of the weathering process by removing much of the gross contamination.

Decontaminate only what is necessary by conducting immediate equipment decon before operational decon. Once operational decon is completed, the contamination hazard on the equipment is neutralized. So, operator's spray down, combined with operational decon, increases the opportunities to conduct unmasking procedures. Operational decon is accomplished primarily by using the following assets currently in the battalion TOA:

- M12A1 or M-17 (contains pump, tank, personnel shower assembly, and water heater units)
- M11 (fire extinguisher-like device for spraying DS2)
- M13 (brush apparatus for scrubbing with DS2)
- Chemical agent monitor (CAM)
- Individual chemical agent detector (ICAD)

Vehicles must be identified as contaminated or noncontaminated before arriving at any operational decon station. If the contamination on the vehicle or equipment can be neutralized with immediate decon procedures, decontaminate and go on with the mission. To be most effective, you should accomplish operational decon as soon as possible.

MOPP gear exchange and vehicle wash down are done in conjunction. The COC establishes a MOPP gear exchange site, upwind of the vehicle wash area. This is the site where Seabees exchange contaminated MOPP gear for a reserve set of MOPP gear. The exchange is normally accomplished by squad-size elements. Unmasking may or may not be possible during this exchange. A well-practiced unit Standing Operating Procedure (SOP) will greatly simplify and ease the carrying out of operational decon procedures.

PREPARATION PHASE

The preparation stage, as its name implies, includes all of the things that must be done before any operational decon can take place.

Site Selection

The COC, along with the CBR officer, selects an operational decon site where little preparation is required and considers the following factors when selecting a decon site:

- Good overhead concealment.
- Good drainage.
- Off the main route but with easy access for vehicles.
- Wind direction.
- Large enough area to handle vehicle wash down and MOPP gear exchange for a squad-size element (100 square meters per site).
- A water source. Plan for about 100 to 150 gallons of water for each vehicle. Of course, larger or dirtier vehicles need more water.

NOTE: The M12A1 PDDA can carry 450 gallons to a decon site; the M17 LDS (with collapsible bladder) can hold 1,500 gallons but must be setup and filled up at the decon site.

Site Setup

The battalion decon crew will setup the vehicle washdown area. An operational decon site takes minimal setup and preparation. The site setup requires positioning the M12A1 or the M17 LDS power-driven decon equipment (PDDE) along the roadway, ready to dispense hot, soapy water. The vehicle washdown process consists of contaminated vehicles moving forward into a site to be washed down (removing gross contamination) and then moving out. Additionally, at least two Seabees that are contaminated set up a MOPP gear exchange site. Prepare MOPP gear exchange at a clean site 50 meters upwind of vehicle wash down. Both the vehicle wash down and MOPP gear exchange operations should operate concurrently.

If water for the M12A1 PDDE has been preheated, preparation for vehicle wash down should take no more than 10 minutes (this is a guideline). Preparation for vehicle wash down using the M17 LDS will take more time if the water bladder must be filled.

EXECUTION PHASE

This phase is the actual conduct of the two operational decon techniques: the vehicle wash down and the MOPP gear exchange. Companies will provide their own security while vehicle wash down and MOPP gear exchange are in progress.

When finished, troops mount their vehicles and move to their new battle positions. **For planning purposes, the vehicle washdown site will process one vehicle every 2 to 3 minutes; and MOPP gear exchange will take approximately 30 minutes.**

Vehicle Wash Down

Before vehicle washdown, units conduct the operator's spray down to increase decon effectiveness. Ensure that water pressure is from 60 to 120 psi; the pressure rate at which most gross contamination can be removed. Vehicle wash down is conducted as far forward as possible and is done by the battalion decon crew. The decon crew will use the power-driven decon equipment (PDDE) currently available in the TOA to conduct vehicle wash down, such as the M12A1 or M17 power-drive decon apparatus (PDDA). If the mission permits, it is most effective to conduct vehicle wash down between 1 to 6 hours after contamination. The longer you wait to remove or neutralize contamination, the harder it will be to do so. Also, the longer you wait, the more opportunity there will be for agents to spread and make contamination problems worse.

Each vehicle receives a 2- to 3-minute vehicle wash down with hot, soapy water from the PDDE. Vehicle operators maintain visual contact with each other to know when to move from concealment to the washdown area. The PDDE operator gives a signal when vehicles are required to move into position. Personnel in wheeled vehicles should dismount before wash down to avoid getting wet. Following this, the vehicle moves to the MOPP gear exchange area. Troops will dismount and conduct MOPP gear exchange by squad or vehicle.

Depending on the availability of equipment, METT-T, and the tactical situation, units have the option to select a one- (table 6-1 and fig. 6-4) or a two-lane wash down. When using two M12A1 or other combinations of decon equipment, two-lane operational decon speeds up the process (table 6-2 and fig. 6-5). Because speed is important and detection is difficult, do not check vehicle for contamination after vehicle wash down. Remove only gross contamination.

MOPP Gear Exchange

MOPP gear exchange is done by squads or crews so that leaders can control the rate of overgarment exchange. This procedure also ensures that adequate stocks of overgarments at company level are maintained and accounted for. Two Seabees can work as a buddy team, or a Seabee can execute the technique by himself. However, when squad leaders supervise, they can prevent unnecessary exchanges of MOPP gear by using the chemical agent monitor (CAM).

During the MOPP gear exchange, you change your contaminated MOPP gear for new, uncontaminated gear. The squad or platoon is responsible for conducting its own MOPP gear exchange at the assembly area of the operational decon site. Decontaminants and chemical suit replacements are provided by supply (S-4) and issued near the decon site.

MOPP gear exchange removes nearly all liquid or solid contamination from you and your individual equipment. When personnel have little, if any, vapor hazards on themselves, they may use hazard-free areas to unmask, to eat, to drink, and to rest temporarily. Before unmasking and lowering MOPP levels for temporary relief, conduct unmasking procedures using the CAM.

Eight steps are used in MOPP gear exchange. The squad forms a circle around a lead team, typically the squad leader and another Seabee. The troops are paired into buddy teams and spaced around the circle with 1 to 3 meters between teams. Members of each team alternate as they go through step 1 (decon gear). At steps 2 through 7, one member completes all steps with the assistance from the other team member. Roles are then reversed. See table 6-3 for detailed instructions on this method.

These techniques do not guarantee safe conditions required to allow unmasking on or near equipment. However, troops may move upwind of dirty vapor equipment into a clean area or collective protection shelter, check for contamination, and then briefly unmask. Conduct continuous contamination checks and monitoring to ensure you stay in clean areas. Use the M258A1 kit and check it every 15 to 20 minutes. Use the CAM every 5 minutes. Use the CAM together with unmasking procedures. Three types of procedures are used for MOPP gear exchange: buddy team, triple buddy system, and individual MOPP gear exchange.

Table 6-1.—One-Lane Wash Down

Steps and Risks	Equipment	Procedures
<p>Step 1. Button up vehicle/equipment. Performing this step prevents contamination from being washed or splashed into uncontaminated areas.</p> <p>RISKS. Failure to perform this step may result in contamination being washed into uncontaminated areas, subjecting crew and maintenance personnel to hazards.</p>	None	Equipment crew/operators close all access doors, hatches, windows, and other openings before washdown. Put muzzle covers on weapons. Nonessential personnel can dismount and begin MOPP gear exchange upon commander's orders. They then act as "buddies" for essential crew/operators.
<p>Step 2. Washdown vehicle/equipment. Performing this step limits spread of contamination, minimizes hazard, and enhances weathering to make detailed equipment decon easier and faster.</p> <p>Risks. If you do not do this step, expect casualties from contact hazards. Spreading or transferring the hazard most likely will increase. Weathering of the hazard will be slowed. You will not be able to reduce MOPP level immediately because an after-vehicle washdown check for contamination is not made. (See "Decon in Combat," Chapter 1, for when to unmask for brief periods.)</p>	<p>Use for all forms of contamination:</p> <ul style="list-style-type: none"> • One PDDE. • Adequate fuel for water heater (if available) and pump unit. • Adequate water supply (about 100 to 150 gallons per vehicle.) • Liquid detergent to mix with water (see Appendix J.) 	<p>Chemical, biological, and radiological: Two troops from the battalion PDDE crew operate washdown equipment. A third troop supervises. Troop must wear toxicological agent protective (TAP) aprons or wet weather gear worn over MOPP gear to keep MOPP gear from becoming saturated. Troops spray hot, soapy water (under pressure) from PDDE onto equipment surfaces. This removes, neutralizes, or destroys most of the gross contamination trapped in dirt mud. Unheated soapy water or plain water may be used, if necessary, but is less effective than hot, soapy water. Start at the top decks of vehicles and wash downward.</p>
Step 3. Vehicles move into assembly area.		Exchange chemical suit.

SITE CLEARANCE PHASE

Although the operational decon operation is done rapidly with little site preparation, these areas will be contaminated when the operation is completed. This could be a hazard to friendly forces reoccupying the area.

Cleanup

The PDDE crew of the unit cleanup the MOPP gear exchange area. They bury or burn the contaminated refuse and retrieve any unused decontaminants. Burning will cause a downwind vapor hazard. **Burying is the preferred method of disposal of contaminated waste.** If you burn it, notify the COC; the COC will notify any units that may be affected by the vapor hazard.

The PDDE crew must control contamination runoff during the execution of operational decon. The PDDE crew should move the PDDE a few meters away from the

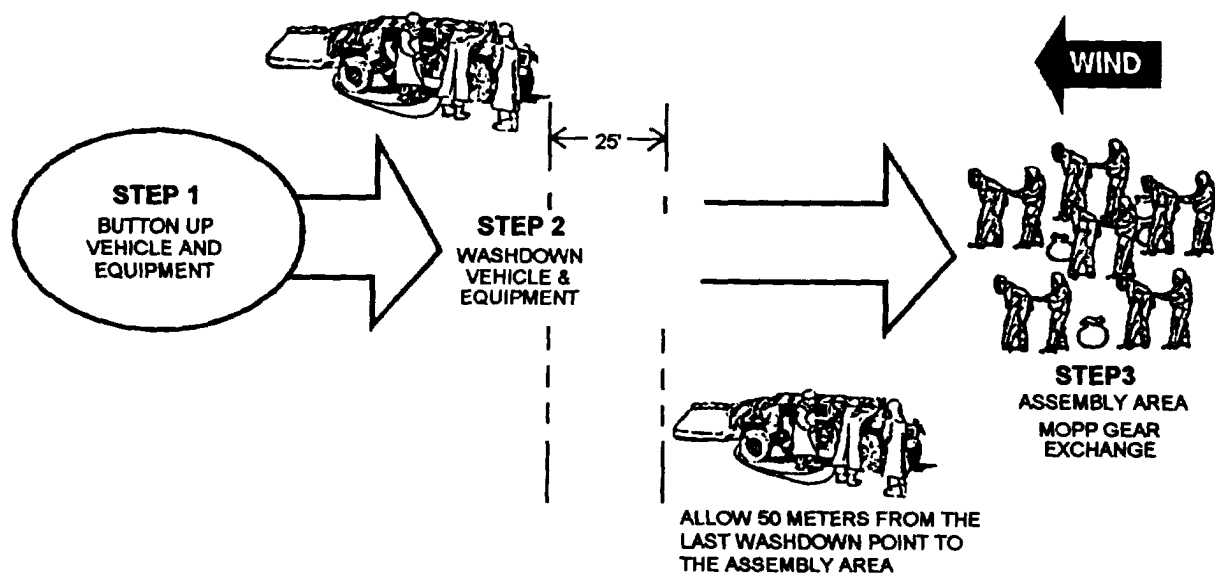
vehicle washdown area and wash the decon equipment, including hoses, after the operation is completed. Wet weather gear or TAP aprons should be decontaminated with STB slurry and retained for future use. If MOPP gear exchange is done at a different location, the contaminated company will be required to clean up after itself.

Marking and Reporting

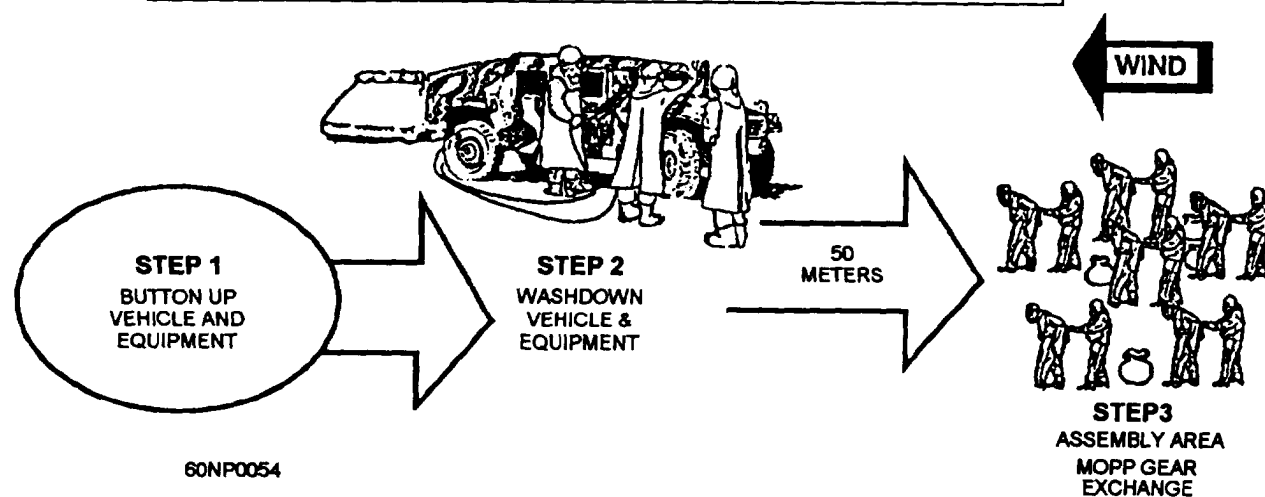
The PDDE crew of the battalion marks the operational decon site with standard NBC warning markers and reports the contaminated area to the COC. The COC sends out a NBC 5 report that alert friendly forces to avoid the area.

OPERATIONAL DECON SUMMARY

For operational and logistical purposes, units should plan to conduct vehicle wash down and



One-lane washdown with one lightweight decontaminating system (shown above)
and with two light weight decontaminating systems (below).



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Figure 6-4.—One-lane wash down.

MOPP gear exchange concurrently. This should be done between 1 to 6 hours of becoming contaminated. This action reduces degradation and improves the ability of the unit to conduct its mission. Decontaminants and replacement MOPP gear are provided by the supply company with a vehicle near the decon site.

MOPP gear exchange and vehicle wash down are best used by squad-size or platoon-size elements. When larger elements try to process through an operational decon site, they lose many benefits of a small decentralized operation. Benefits of a squad- or platoon-sized decon operation include the following:

1. Tailored decon operations are flexible and responsive to small unit needs.

2. Small, speedy operations are more easily concealed in one location near the forward area.

3. A water source may not be needed at the decon site because most power-driven decon equipment (PDDE) have a water-carrying capability to support squad-sized elements.

Units must develop their own Standing Operating Procedure (SOP) for obtaining temporary relief from MOPP 4. The SOP is based on each unit's equipment and mission. Although every operation is unique, methods should be standardized when possible. In any case, personnel must know the following:

Table 6-2.—Two-Lane Wash Down

Steps and Risks	Equipment	Procedures
Preaction: Unit tactically disperses in concealed marshalling area. Makes contact with control point for final orders. Control point monitors and supervises rate of movement into lanes to prevent congestion.	Watch	One soldier from the Battalion decon crew. Every three minutes two vehicles will be released from the marshalling area. On signal vehicles will proceed to the decon station in their respective lane.
Step 1. Button up vehicle/equipment. Performing this step prevents contamination from being washed or splashed into uncontaminated areas. This step applies for both lanes. RISKS. Failure to perform this step may result in contamination being washed into uncontaminated areas, subjecting crew and maintenance personnel to hazards.	None	Equipment crew/operators close all access doors, hatches, windows, and other openings before washdown. Put muzzle covers on weapons. Nonessential personnel can dismount and begin MOPP gear exchange. They then act as "buddies" for essential crew/operators. Note: Ensure that vehicles equipped with overpressurized systems are operating with systems on. No MOPP gear exchange is required if crew/operators are inside vehicle and have not been exposed to any contamination.
Step 2. Washdown vehicle/equipment . Crews/drivers remain in vehicles. Sprayers use cross diagonal technique for two to three minutes, removing gross contamination. This technique avoids water splashing the crew members. Performing this step limits spread of contamination, minimizes hazard, and enhances weathering to make detailed equipment decon easier and faster.	<ul style="list-style-type: none"> • Adequate fuel for water heater (if available) and pump unit. • Adequate water supply (about 100 to 150 gallons per vehicle.) • Liquid detergent to mix with water (see Appendix F.) NOTE: Use M12 PDDE, M17 LDS, 65-GPM pump, fire-fighting equipment, and/or combination.	Chemical, biological, and radiological: Two troops from the battalion PDDE crew operate washdown equipment. A third troop supervises. Troop must wear toxicological agent protective (TAP) aprons or wet weather gear worn over MOPP gear to keep MOPP gear from becoming saturated. Troops spray hot, soapy water (under pressure) from PDDE onto equipment surfaces. This removes, neutralizes, or destroys most of the gross contamination trapped in dirt mud. Unheated soapy water or plain water may be used, if necessary, but is less effective than hot, soapy water. Start at the top decks of vehicles and wash downward.
Step 3. Vehicles move into assembly area. MOPP gear exchange is determined by the commander.		Exchange chemical suit.

1. How to recognize and understand contamination hazards and how to avoid contamination when possible.

2. How to protect yourself and your equipment if contaminated.

3. Know the capabilities and limitations of MOPP gear.

4. Know how to neutralize or remove contamination hazards.

5. Do only as much decon as you need to continue your mission.

The following sample checklist (table 6-4) can be used by the battalion decon team for planning operational decon operations:

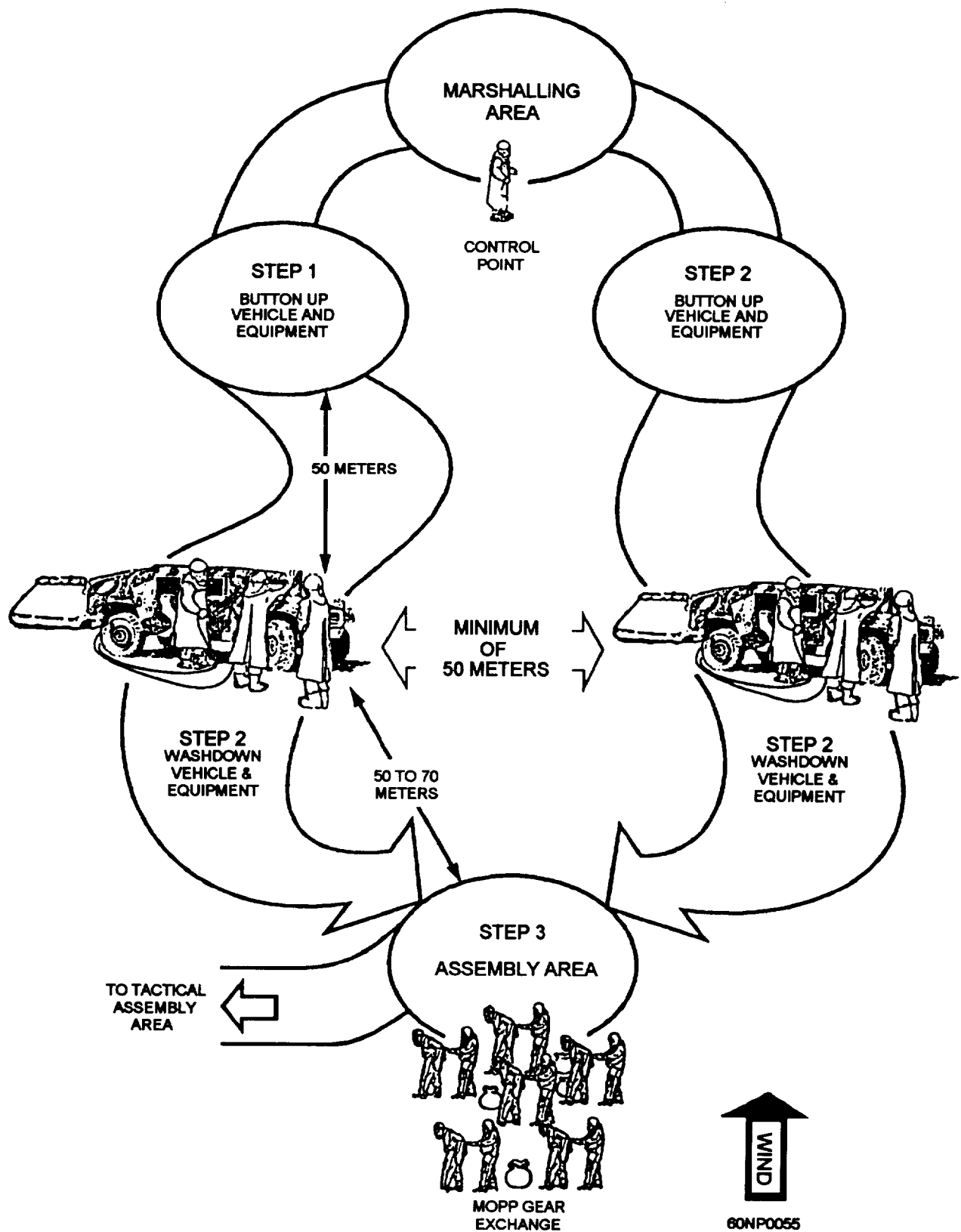


Figure 6-5.—Two-lane wash down.

Table 6-3.—Mopp Gear Exchange

Steps	Equipment	Procedures
Step 1. Decon gear: (weapon, helmet, load-bearing equipment, and mask)	All contamination: <ul style="list-style-type: none"> • Long-handled brushes. • Poncho or plastic. Chemical/biological: <ul style="list-style-type: none"> • One 5-gallon container STB dry mix. Radiological: None	Chemical/biological: Brush or rub STB dry mix into personnel gear. Gently shake off excess. Radiological: Shake or brush contamination off.
Step 2. Decon mask and gloves:	All contamination: <ul style="list-style-type: none"> • One skin decon kit per person 	Buddy will decon members mask, all exposed parts including canister using skin decon kit. Each member then decons their gloves.
Step 3. Remove overgarments/overshoes:	All contamination: <ul style="list-style-type: none"> • Two discard containers (recommend plastic bags). 	All contamination: Buddy will: <ul style="list-style-type: none"> • Loosen drawstring on members hood. • Unfasten Velcro tabs on members smock. • Cut smock from back-bottom, up through hood at neck. • Lower hood. • Member makes fist, buddy pulls smock off from front, turning smock inside out. • Place smock on ground, back side up. • Unfasten Velcro tabs on trouser. • Cut suspenders and trouser legs up to knees. • Grasp trousers by cuff while member pulls one leg at a time from trouser. • Discard trouser.
Step 4. Remove overboots and gloves:	All contamination: <ul style="list-style-type: none"> • Containers from step 3. 	All contamination: <ul style="list-style-type: none"> • Member stands next to discarded smock. • Untie or cut laces on boots. • Pull off boots, one at a time. • As boot in each boot is removed, member steps on smock. • Member removes own gloves.
Step 5. Don new overgarment:	<ul style="list-style-type: none"> • Chemical protective overgarment (one per person). • M9 paper. 	All contamination: <ul style="list-style-type: none"> • Buddy opens trouser package without touching inside. • Member removes trousers without touching outside of package, and dons. • Buddy opens smock package without touching inside. • Member removes smock without touching outside of package, and dons.
Step 6. Don overboots and gloves:	<ul style="list-style-type: none"> • Overboots and gloves. • M9 paper. 	All contamination: <ul style="list-style-type: none"> • Buddy picks up and opens new package of boots without touching inside. • Member reaches inside and removes boots without touching outside of package. • Member don overboots and fasten Velcro tabs on trousers. • Buddy picks up and opens new package of gloves without touching inside. • Member removes inner and outer gloves without touching outside of package. • Member don inner and outer gloves and fasten Velcro tabs at sleeves.
Step 7. Secure hood:	<ul style="list-style-type: none"> • Chemical protective overgarment (one per person). • Skin decon kit. 	All contamination: <ul style="list-style-type: none"> • Buddy decon own gloves with skin decon kit. • Buddy raises members hood, positions, and secures with drawstring. • Buddy checks members MOPP gear thoroughly for openings.
Step 8. Reverse roles, repeat steps 2 through 7 and secure gear:	N/A	

Table 6-4.—Operational Decon Checklist.

1	Decon assessment	If the unit has no decon assets, COC will request assistance from higher headquarters.
2	Coordination	COC coordinates with the decon team of the unit. The decon should be done between 1 to 6 hours after becoming contaminated.
3	Site selection	COC selects the decon site and considers the following items: <ul style="list-style-type: none"> • Off main route but easy access • Large enough area (100 square meters per site for a squad-size element) • Good overhead concealment • Water source (100 gallons per vehicle) • Good drainage
4	Site setup	Ensure the PDDE is positioned properly and ready to dispense hot, soapy water. Ensure that each company operates the MOPP gear exchange simultaneously at the vehicle wash down.
5	Site control and security	Ensure vehicle operators know when to move into position at the washdown location. Ensure companies have provided site security.
6	Processing	Decon petty officer in charge (POIC) ensures vehicles are processed at a rate of 3 minutes per vehicle. Ensure personnel are conducting MOPP gear exchange, if needed.
7	Cleanup	Decon petty officer in charge (POIC) ensures the MOPP gear exchange area is cleaned up.
8	Marking and reporting	NBC officer ensures the decon site is properly marked and assists the COC in sending out an NBC 5 report to higher headquarters.

It is important to remember that performing operator's spray down before hasty decon will decrease the contamination transfer and increase the survivability of the crew.

THOROUGH DECON OPERATIONS

Thorough decon operations reduce contamination to negligible risk levels. They restore combat power by removing nearly all contamination from unit and individual equipment. Thorough decon enables troops to operate equipment safely for extended periods at reduced MOPP levels. A small risk remains, so periodic checks with the CAM, M8/M9 paper, or M256-series kit must be made after each operation. After thorough decon, the unit moves out of the decon site into a tactical assembly area. The unit, while in this tactical assembly, may undergo reconstitution or prepare for future operations.

Operational decon requires fewer resources but physically removes only surface contamination. Thorough decon is the most effective type of decon

and is the most resource intensive. Weathering causes a significant reduction of contamination overtime, but the immediate reduction of contamination to negligible risk levels does not normally occur. Weather conditions, agent used, mission requirements, time, troops, and supplies available may all combine to make weathering the decon option of choice. Based on the recommendation of the CBR officer, the COC decides which type of decon is the most efficient and effective for their unit.

A limiting factor that must be considered when planning any decontamination operations is the availability of water. A typical vehicle will require 500 gallons of water during detailed equipment decon. In a water-scarce environment, such as deserts, the CBR officer must coordinate a water resupply plan with other units in the area of operation. A water resupply plan can include selecting a series of link-up points along a route. The unit can link up with a bulk water truck from other units. More complex water

resupply plans include linking up with bulk water trucks, caching water throughout the area of operations, coordinating for the movement of water bladders by aircraft, and the identification of water sources in the area of operation of the unit. The use of nonpotable, salt, and brackish waters should be considered.

The thorough decon site consists of four main areas: the predecon staging area, the postdecon assembly area, the detailed troop decon (DTD), and the detailed equipment decon (DED). Selection of all four areas are based on operational guidance, road network, available cover and concealment, and water supply.

The predecon staging area is used by the contaminated unit to ready them for detailed equipment decon (DED) and detailed troop decon (DTD) operations. The process at the DED includes removing, neutralizing, or reducing contamination on interior and exterior surfaces of equipment to negligible risk. The DTD is the process of decontaminating individual fighting equipment to negligible risk and removing contaminated MOPP gear from the troops.

The postdecon assembly area is the location where vehicles and troops exiting the DED and DTD are linked. This is done before moving from the decon site.

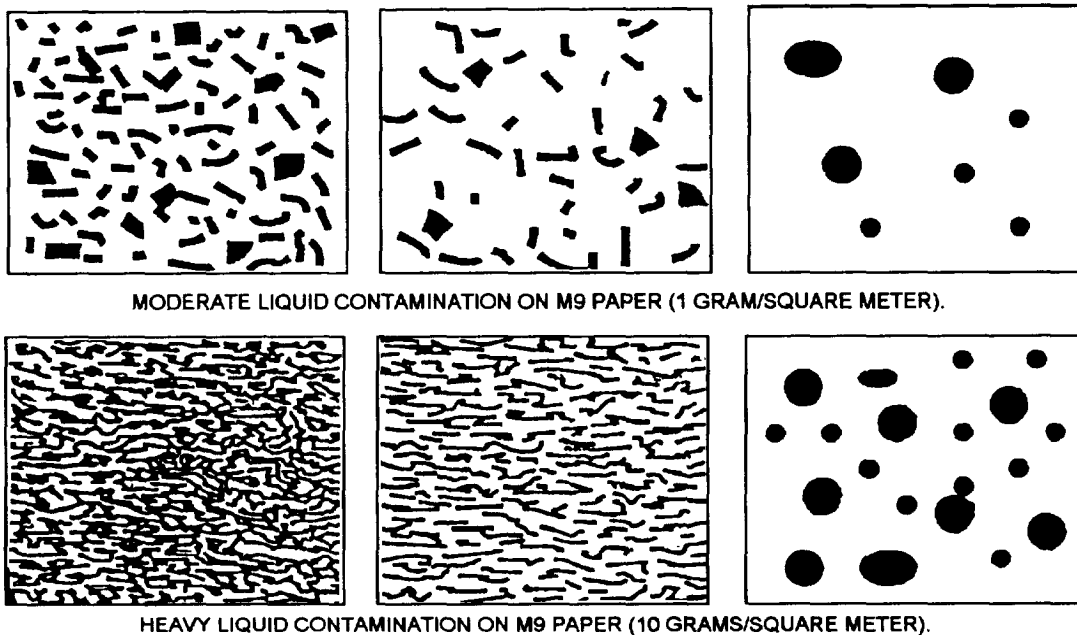
PREDECON STAGING AREA

The contaminated unit, by company, moves to a predecon staging area approximately 250 to 500 meters downwind of the thorough decon site. Here, the contaminated unit conducts the required predecon actions that are designed to prepare the unit for the thorough decon operations. Predecon actions include the following:

1. Segregate contaminated vehicles from uncontaminated vehicles, if possible.
2. Allow vehicle crews to dismount and prevent further transfer/spread of contamination.
3. Prepare vehicles for detailed equipment decon.
4. Move contaminated vehicles and troops to the detailed troop and equipment decon lines.

Segregate Vehicles

Check all vehicles for contamination, using detection equipment. For chemical contamination, use the CAM and M8 detector paper. Also, visually check the vehicles for contamination using M9 paper. M9 paper affixed to vehicles reveals the presence of contamination and provides an indication of the level of contamination (fig. 6-6).



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Figure 6-6.—Contamination levels.

When using the chemical agent monitor (CAM), such as the M256A1, ensure there is sufficient distance between vehicles. If the vehicles are parked too close together, vapor drift from contaminated vehicles may falsely identify uncontaminated vehicles as contaminated.

For radiological contamination, use the AN/PDR-27-series or AN/PDR-43 radiac detectors. If the vehicle only has isolated areas of contamination, use a portable decontaminating apparatus (M11) to decontaminate the chemically contaminated area. Vehicles found to have no contamination are sent to the reconstitution assembly area.

Crews Dismount

The vehicle crews, except drivers, dismount. As the crews dismount, they remove all equipment from the top of the vehicles. Once crew members have exited the vehicle, they will not reenter. This prevents further contamination from being spread into the vehicle interior.

Prepare Vehicles

The crews prepare their vehicles for processing through the detailed equipment decon (DED). All heavy mud and debris are removed from the vehicle by the crew. The crew should concentrate on the vehicle undercarriage. The reason for this is twofold: (1) contamination will most likely collect here and (2) the undercarriage is the hardest place to decontaminate. Tools used by the crew are placed back on the vehicle when finished.

Seat covers (when applicable), canvas items, camouflage netting, and any other materials that can absorb liquid contamination are removed from the vehicle. These items create a potential transfer hazard and are not easily decontaminated. Appendix V provides guidance on hard-to-decon items. Left untreated, absorbed chemical agents will desorb after being decontaminated and create a vapor hazard. Items that cannot be decontaminated by the standard methods used in detailed troop decon (DTD) are also removed and placed at a collection point.

Move To DED and DTD

In coordination with the decon petty officer in charge (POIC), the contaminated unit will begin to send contaminated vehicles and personnel to the DED

and DTD. The COC has prioritized the vehicles for processing, sending the most important first. Communication is maintained between the predecon staging area and the POIC. All assistant vehicle drivers are the first individuals sent through the DTD to ensure there is a driver exchange at station 3 of the DED.

POSTDECON ASSEMBLY AREA

The company assembles in the postdecon assembly area after completing DTD and DED operations. The unit occupies this area before moving to a reconstitution location. The decon POIC will select the general location. It should be big enough to hold the entire unit undergoing thorough decontamination with proper cover and concealment. The assembly area should be located approximately 1 kilometer upwind from the DED and DTD.

DETAILED TROOP DECON (DTD)

Removing contaminated MOPP gear, including the protective mask, is the major action in detailed troop decon. If DTD is not performed, chemical agents may eventually penetrate the overgarment and contaminate underclothing or skin. How long the chemical agent will take to penetrate the clothing depends on the condition of the MOPP gear and the amount of agent on the gear. If contaminated with radiological contamination, the hazard will remain until removed.

The contaminated unit is responsible for setting up, operating, and closing the DTD in a thorough decon site. The CBR officer recommends to the COC the general location of the DTD within the decon site. He or she will also provide the COC technical advice on the setup, the operation, and the closure of the DTD.

The DTD has eight stations. The following pages discuss actions at each station and the resources required.

Station 1—Individual Gear Decon

Actions at this station remove contamination to a negligible risk level from individual equipment (782 gear, mask carrier, helmet, and weapon).

PREPARATION— The following equipment and supplies are recommended for station 1:

- Three 30-gallon containers
- Two long-handled brushes
- Sufficient supertropical bleach (STB) slurry mix

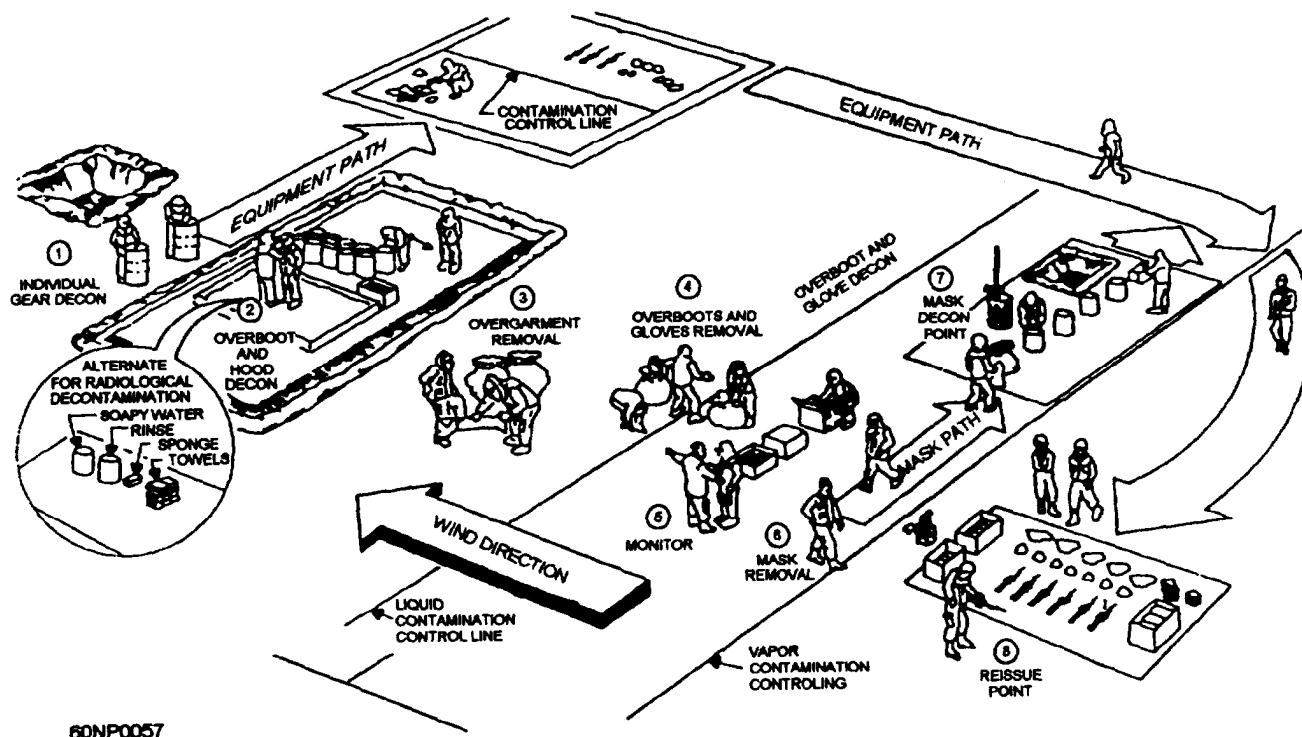


Figure 6-7.—Detailed troop decon layout.

- Two ponchos or plastic tarps

Dig a sump 6 feet square and 4 feet deep. Place three 30-gallon cans near the sump (fig. 6-7).

Fill two cans with an STB slurry mixture. The other can is filled with clean water for the rinse. Place two long-handled brushes at each can of the STB slurry.

To prepare the slurry, mix 100 pounds of STB with 20 gallons of hot water. Change the mixture after 20 troops have decontaminated their gear. Change the rinse water after every 10 troops or when it appears dirty.

Place a poncho or plastic tarp on the ground at the checkpoint. Divide the poncho or tarp in half, using tape. **This is the contamination control line (CCL).** The checkpoint will be a minimum of three meters from all other stations. This will ensure a true reading on the detection equipment. Place the following chemical detection/identification equipment at the check station for an average company-sized unit:

- One CAM
- Eight books of M8 chemical detector paper
- Four M256-series chemical agent detector kits
- One hundred plastic trash bags

Three troops are required to operate this station. One supervises the decontamination of the individual

gear and takes the decontaminated equipment to the check station. He or she also prepares new slurry mixtures of STB as necessary. One troop remains at the checkpoint and checks all gear for completeness of decontamination, using the detection equipment. One troop transports the decontaminated gear to the reissue station.

EXECUTION— Decontaminate the gloves with the water or STB slurry mix. If wearing the M24, M25A1, or M42 mask, use hot, soapy water and sponge or STB dry mix to decontaminate the hose and canister. Decontaminate the gear by washing it in the decontaminant container and scrubbing the gear for 6 minutes. Then dip the gear into the rinse water for 4 minutes. The station attendant will take the gear to the equipment checkpoint. **Place the decontaminated gear on the “dirty” side of the contamination control line (CCL).** The monitor checks the gear for contamination using the appropriate detection devices. The monitor holds the detection device 1 inch from the gear and checks for residual contamination. If the residual contamination exceeds negligible risks, recycle the gear and decontaminate it again. If the gear passes the check, place it **on the clean side** of the contamination control line. An attendant carries the equipment to the reissue point.

You must understand that the preceding paragraph outlines the minimum that should be done. Depending on time available, more extensive washing and checking procedures may be useful. You may decide to wash equipment longer or let it air outside after washing. This further reduces the amount of agent vapor desorbing (or bleeding) out of the pistol belt, mask carriers, helmet covers, and so forth. Equipment can be put in closed areas or plastic bags and checked for hazardous vapors with CAM or M256-series chemical agent detector kit. The CAM will only detect the nerve agent (G) and blister agent vapors (H).

Station 2—Overboot and Hood Decon

Actions at this station neutralize gross contamination on overboots and lower trouser legs. Gross contamination on the exposed parts of the protective mask is also decontaminated.

PREPARATION— Prepare a shuffle pit by digging a shallow pit about 3 feet wide by 3 feet long by 6 inches deep. Fill the shuffle pit with a supertropical bleach (STB) dry mix. Prepare the STB dry mix by mixing 3 parts earth to 2 parts STB. Add more STB to the mix after ten people have processed through the shuffle pit. The following equipment/supplies are needed at this station:

- One M258A1 or M291 skin decontaminating kit per person
- 6 feet by 6 feet piece of plastic
- Trash bags (as required)
- Ten drums of STB

Only one decon team member is required to operate this station. The buddy system is used to decontaminate the overboots and protective mask.

EXECUTION— Walk into the shuffle pit that is composed of STB dry mix (3 parts earth and 2 parts STB). Use gloved/protected hands to rub STB dry mix on the boots and lower trousers. Decontaminate the hood according to one of the two following procedures. Use the skin decon kit to decontaminate the hood and exposed parts of your buddy's mask. When you have finished decontaminating your buddy's mask, decontaminate your gloves with the skin decon kit in preparation for decontaminating your buddy's mask.

NOTE: Buddies should check each other's overboots and overgarment for damage. Any rips, tears, or punctures in overboots, rubber gloves, or overgarment should be reported to the attendant at station 5. This will allow the attendant at station 5 to check you for chemical agent symptoms and your clothing for possible contamination.

Station 3—Overgarment Removal

Performing this step ensures removal of the contaminated overgarments before an agent penetrates the overgarment material and touches the undergarments or skin.

PREPARATION— The materials and equipment needed at this station are as follows:

- Cutting tool
- Two 30-gallon garbage cans
- One hundred plastic bags (or at least one per Seabee)
- Ten boxes M258A1 or M291 decon kits

This station requires only one decon member. He or she supervises the actions of the troops processing through the station.

EXECUTION— Buddy teams will divide and continue the decontamination process individually. The station attendant assists in the removal of the smock and trouser by cutting them off.

CAUTION

Ensure that contaminated parts of the trousers and smock do not fold in and touch the clean uniform.

The station attendant cautions the troops not to rub the contaminated boot against his or her clean leg and to step wide enough so as not to rub the clean leg against the overgarment. If this step is done improperly, the agent may be transferred to the underclothing or skin.

Station 4—Overboots and Gloves Removal

This step removes contaminated overboots (footwear covers) and gloves to limit the spread of contamination. Overboots and gloves are also decontaminated for reissue.

PREPARATION— The following equipment and materials are needed:

- Tape
- Cutting tool
- Eight 30-gallon containers (garbage cans)
- One hundred plastic bags (or one per Seabee)
- Two scrub brushes
- Two ponchos or large plastic sheets
- CAM
- M8 paper
- 10 percent STB/HTH solution
- Hot, soapy water
- Cold rinse water

The station will be setup as shown in figure 6-7. Fill two 30-gallon containers with hot, soapy water and two containers with 10 percent STB/HTH solution. Place the two scrub brushes near the containers. Fill two 30-gallon containers with cold rinse water.

Two decon team members are needed to decontaminate the overboots and gloves. One person processes the overboots, while the other person processes the gloves.

Use the tape to mark the liquid contamination control line (LCL) on the ground clearly. The LCL separates the “dirty” from the “clean” areas. Place the cutting tool, two containers, and the plastic bags on the “dirty” side of the liquid contamination control line.

NOTE: An exception to the clean area is the contaminated gloves. However, you must ensure no liquid agent is spilled on the ground beyond the liquid contamination line.

EXECUTION— The attendant unfastens or cuts the strings or elastic closures on the boots. The station attendant holds the boot while the Seabee steps out and across the control line. The action is repeated for the other boot. Boots are then discarded in the designated container by the station attendant. If the boot cannot be removed by this process, the attendant cuts off the boot. The Seabee works the chemical protective gloves loose using the pinch-pull method, and the station attendant pulls the gloves off. The station attendant discards the gloves in a container **on the “dirty” side of the control line**. Station 4 attendant does his or her duty from the dirty side of the liquid contamination control line.

The boots and gloves are decontaminated in the following process:

Step 1. Submerge the gloves and boots into the container of hot, soapy water. Some contamination will be removed during this step. When the boots and gloves are removed from the container, ensure that no water remains inside the boots and gloves. **Do not decon any item that is unserviceable.**

Step 2. Submerge the boots and gloves into the container of HTH solution. Thoroughly scrub the items until no visible contamination remains. After scrubbing, submerge each item again before moving them into the rinse container.

Step 3. Thoroughly rinse the scrubbed items, making sure that the items are rinsed inside as well as outside. Check all the gloves and boots for holes, tears, or punctures and discard any that are found.

Step 4. Dry the usable items. Discard any glove or boot having punctures, tears, rips, holes, or other damage into a pile. Place the usable items on the poncho or plastic sheet to air-dry and weather.

Step 5. Place the items into the plastic trash bags, along with an M256 detector ticket. If the detector ticket shows no contamination, the items can be reissued or stored for issue later. If the detector ticket shows contamination remaining, the station attendants can recycle the items or discard them.

Obviously, you cannot check for the agent on the combat boots if you do not remove the overboots. If the overboots are not properly removed, you risk contaminating your combat boots and spreading contamination to clean areas. If rubber gloves are not properly removed, you risk contaminating your skin and underclothing at this and the following stations.

Station 5—Monitor

Performing this step identifies contamination on personnel, provides spot decon capability, and provides medical aid, as required.

PREPARATION— The following materials and equipment are needed:

- First-aid supplies
- CAM
- Five packs M8 detector paper per 100 people
- One case M258A1 or M291 skin decontaminating kits per person

Two troops are needed to operate this station. A corpsmen should be present to treat any personnel suffering from chemical agents symptoms.

EXECUTION— The monitor checks the individuals for contamination. Corpsmen will administer first aid as required. Liquid agent can be detected with the M8 detector paper. Small quantities of agent vapor can be detected with the CAM. Symptoms of agent poisoning are the most obvious indication of skin contamination. At this step, the medic checks each troop for symptoms and treats them as required. Troops should report any damage to their MOPP gear that was identified at stations 2, 3, and 4. Any areas identified as contaminated can be decontaminated with the M258A1 or M291 decontaminating kit by the station attendants. Individuals will be monitored after decon. It is possible that all liquid chemical contamination is absorbed into the clothing. Chemical detector paper (M8 and M9) will indicate negative, even though there is a hazard. The COC can choose to conduct more extensive contamination checks here if time is available. This will decrease the risk of casualties.

Station 6—Mask Removal

Performing this step removes the mask without contaminating the Seabee. The mask is taken to a mask decon point, limiting agent transfer at the site.

PREPARATION— The following equipment is needed:

- M8A1 automatic chemical agent alarm

Two troops are needed to operate this station. They remove and carry masks to the mask decon point (station 7).

EXECUTION— If the hood is still attached to the mask, the attendant pulls the hood over the front of the mask, grabs the mask by the voicemitter cover, and pulls the mask off the individual. The individual holds his or her breath as the mask is removed. If the mask has optical inserts, the attendant holds the mask open so the individual can remove the inserts without touching the outside of the mask. The individual then walks upwind 5 meters, crosses the vapor contamination control line, and resumes breathing. The station attendant brings the mask to station 7, mask decon point.

No chemical vapor hazard is expected beyond the vapor hazard contamination control line if the wind direction remains constant. Position the M8A1 or the M-21 automatic chemical agent alarm upwind of the site to warn of vapor hazards.

Station 7—Mask Decon Point

Performing this step removes all the contamination from the mask.

PREPARATION— The following material and equipment are needed:

- Four containers (about 3-gallon capacity)
- CAM (for chemical only)
- Hot, soapy water
- Rinse water
- Mask sanitizing solution
- Immersion heater 30-gallon container
- Two sponges
- One case of paper towels

Dig a sump (4 feet wide by 4 feet long by 4 feet deep) in which to discard used filters and canisters.

Three troops are needed to operate this station. Two troops will strip, wash, rinse, sanitize, and dry masks. The other troop checks the masks and carries them to the reissue point.

EXECUTION— Remove the eye lens, the outserts, and the hood, if the hood was not cut off at station 2. Remove and discard the filters or canisters. Put the items into the properly marked containers. Wash the mask, the hood, and the outserts in hot, soapy water. Rinse them in clean water, dip into sanitizing solution, agitate for 5 minutes, then rinse in clean water again. Add one tube of mask sanitizing solution (calcium hypochlorite) to each quart of water. Wipe with rags until they are almost dry. Discard each gallon of mask sanitizing solution into a sump after ten masks. The attendant checks for contamination with a CAM. If the mask is still contaminated the attendant recycles it for more decon and then decontaminates his or her rubber gloves. If the mask is not contaminated, the attendant takes the unassembled mask to the reissue point. The attendant must take care not to contaminate the reissue point or themselves.

Not properly performing this step will cause the risk of contaminating troops when reissuing masks at the reissue point. Even though the step is done correctly, there is still a possible danger when many masks are stacked together. Small amounts of residual vapor from each mask can become potentially dangerous.

Station 8—Reissue Point

Performing this step will ensure that you receive all of your individual gear and your protective mask with all the components.

PREPARATION— You will need the protective mask PLL parts. The unit supply company and chemical POIC set up the reissue point to provide the troops with replacement parts and assist in mask maintenance.

EXECUTION— Reissue the mask with the components to the troops who assembles the mask in the assembly area. Individuals pick up individual gear and move it to postdecon assembly area.

DETAILED TROOP DECON SUMMARY

Three lines are established when setting up for detailed troop decon: contamination control line (CCL), liquid contamination line (LCL), and vapor contamination line (VCL). It is critical that contamination is maintained at each line and does not cross each line. Eight stations are used for detailed troop decon. Table 6-5 is a company level detailed troop personnel and equipment recapitulation for each station.

Table 6-5.—Detailed Troop Decon Personnel and Equipment Recapitulation

Station	Personnel	Equipment
Station 1 Individual	2 decon team members 1 monitor (CAM operator)	3 30-gal containers 2 long-handle brushes 2 ponchos or plastic sheets 1 CAM 8 M8 detector paper 4 M256A1 kits 100 trash bags
Station 2 Overboot and Hood Decon	1 decon team member	60 M258A1 (one per person) 2 ponchos or plastic 100 trash bags
Station 3 Overgarment Removal	1 decon team member	2 cutting tools 10 M258A1 kits 2 30-gal containers 100 trash bags
Station 4 Overboot and Glove Removal	1 decon team member	2 30-gal containers 100 trash bags Tape Cutting Tool
Station 5 Monitor	1 CAM operator 1 Corpsmen	1 CAM 5 M8 detector paper kits 24 M258A1 kits
Station 6 Mask Removal	2 decon team members	1 M8A1 or M-21 chemical alarm
Station 7 Mask Decon Point	2 decon team members 1 monitor	4 3-gal containers 1 CAM 2 sponges 1 case paper towels 1 immersion heater w/container Mask sanitizing solution
Station 8 Reissue Point	Supply company POIC Decon POIC	Mask PLL

DETAILED EQUIPMENT DECON (DED)

ALFA Company is normally responsible for the setup, the operation, and the closure of the DED portion of the thorough decon operation. The COC will select the DED site. The DED for chemical and biological contamination is comprised of five stations. For radiological contamination, the DED uses all but station 2, DS Application. Actions at each station are described below. Appendix VI is a work/rest table for DED.

Station 1—Initial Wash

The objective of this station is to remove the gross contamination and dirt from the vehicle. The vehicle is sprayed for 2 to 3 minutes with hot, soapy water. The vehicle is then scrubbed to help remove caked-on dirt. The mechanical action of scrubbing also helps remove thickened chemical agents. Although the undersurface is difficult to reach, try to remove as much dirt as possible. This station will use approximately 250 gallons of water per vehicle. Larger vehicles or vehicles with large quantities of dirt will use more water. **The runoff from this station is contaminated and must be treated as hazardous.** This station requires high water pressure systems (M12A1 PDDA), rather than high water volume systems (65-gpm pumps).

Hot, soapy water is water heated to about 120°F to 140°F to which a detergent has been added. Hot water alone is less effective than hot, soapy water. Because of the high temperature, some agents are best removed by steam through vaporization. Finally, for some chemical agents cold water exhibits better solvent characteristics.

Station 2—DS2 Application

The objective of this station is to apply decontaminant to the entire vehicle. The vehicle is divided into four parts, and a member of the scrubbing team is assigned each part of the vehicle. This limits the work load of each member of the scrubbing team and avoids duplication of work. DS2 is applied starting at the top of the vehicle and working toward the undercarriage. Every effort is made to apply DS2 to the undercarriage, especially if the vehicle has

crossed a contaminated area. The mop is the least tiring method of applying DS2. Using a mop to apply DS2 creates a large amount of spillage. However, continual use of the M13 (decon scrub brush) requires the scrub team to exert more energy than using the mop. In hard-to-reach places, use the M13 to apply DS2.

Before the start of this operation, the scrub team pours 5-gallon cans of DS2 into 30-gallon trash cans if mops are going to be used instead of the M13. Each member of the scrub team will wear wet weather gear to protect themselves from the DS2.

NOTE: Water adversely affects DS2's ability to react with chemical agents. When water in DS2 reaches 20 percent by weight, the reaction between DS2 and the chemical agent stops.

If there is excess water remaining on the vehicle from station 1, there are several options:

- Wait for most of the water to evaporate.
- Remove the excess water.
- Increase the amount of DS2 applied.

There must be sufficient DS2 on the item being decontaminated for complete neutralization to occur. The DS2-to-agent ratio needs to be 55 to 1 for H agents and 25 to 1 for G agents. DS2 should be applied with scrubbing. Scrubbing increases the mixing of the agent with DS2, especially when thickened chemical agents are present.

Station 3—Wait/Interior Decon

The objective of this station is to allow the DS2 to neutralize the chemical agent and to decontaminate the interior of the vehicle completely. Vehicles are moved to a concealed position. Vehicles will remain in station 3 for **no less than 30 minutes**. When you allow the DS2 to remain on the contaminated surface for 30 minutes, the amount of agent that will later desorb (off gas) will be significantly reduced. When there is a 30-minute contact time, there will be no resorption after decon operations for most chemical agents. However, studies suggest that HD vapor will desorb after decon, even if DS2 is allowed to remain for 30 minutes.

While the vehicle is held in this station for the DS2 to react completely, the driver inspects the interior of the vehicle for liquid contamination. The driver will be given M8 detector paper. If the driver identifies chemical contamination, he or she will be given decon

supplies to decontaminate the interior of his or her vehicle. The best decon solution for use in the interior of vehicles is a 5 percent solution of HTH or STB. The driver wipes all reasonable accessible surfaces with a rag or sponge soaked in the HTH or STB solution. Do not attempt to decon areas where there is little likelihood of contamination (electrical assemblies, etc.).

CAUTION

Do not mix HTH or STB with DS2. If mixed, a violent reaction will occur.

Once interior decon is completed, the driver dismounts from the vehicle and proceeds to the start of the detailed troop decon (DTD). Having completed the DTD, the assistant driver mounts the vehicle and moves it to the next station. Drivers must exercise caution when entering or exiting the vehicle. A DS2-coated surface is slippery and DS2 may react with chemical protective footwear. Personnel should avoid stepping in DS2 and tracking it into the vehicle.

For radiological contamination, use an AN/PDR 27-series radiac meter to decide the extent and location of contamination inside the vehicle. If there is contamination, figure out the intensity of the contamination inside of the vehicle. If the contamination has an **intensity greater than 0.33 cGy (the negligible risk)**, the interior of the vehicle must be decontaminated. Use hot, soapy water to wash the contaminated areas. Use a sponge to mop up the water and the contamination. Table 6-6 is a planning guide for decon mixtures.

Station 4—Rinse

The objective of this station is to remove the DS2 from the vehicle. The vehicle is sprayed with water

from top to bottom. Take care to rinse the undercarriage. This station uses approximately 200 gallons of water. Failure to remove all the DS2 from the vehicle may cause false positive readings at station 5. If high water pressure systems (M12A1 PDDA, M17 LDS) are not available, large volume water pumps (65-gpm pumps) should be used at this station.

Station 5—Check

The objective of this station is to check the completeness of the decon. This station determines whether the vehicle has a negligible risk or still has significant contamination remaining. Detection procedures will vary depending on the type of contamination. If significant contamination is found on the vehicle, the vehicle will be recycled to station 2 for chemical contamination or station 1 for radiological contamination.

Chemical

The CAM is used to check for the presence of vapor from residual liquid contamination. A one bar or lower reading on the CAM indicates a negligible risk. Once the CAM indicates the presence of vapor contamination, M8 detector paper is used to verify the presence of liquid contamination. If it is suspected that both the CAM and M8 paper are producing a false positive reading, use an M256 chemical detector ticket to confirm or deny the presence of contamination. Table 6-7 is a list of common interference that can cause false positive readings on the CAM. If the vehicle has significant contamination remaining, recycle it.

There will be desorption of chemical agents from the surfaces after decontamination. On CARC-painted surfaces, the desorption of vapors will stop sooner than alkyd-painted surfaces. Consider this when checking decontaminated items for overall decontamination effectiveness.

Table 6-6.—Preparation of Decon Mixtures

Decon Mixtures		
Solution	1 gallon of water	5 gallons of water
5 percent	.6 pounds STB/HTH	3.6 pounds STB/HTH
10 percent	.75 pounds STB/HTH	4.5 pounds STB/HTH

Table 6-7.—Common Interferences That Can Cause False Positive Readings on the CAM.

Interferant	G-Bar Response	H-Bar Response
M258A1 decon kit		High
M280 DKIE		High
DS2	Low	
Insect repellent	Low-Very High	
Brake fluid	High-Very High	Very High
Cleaner, general purpose	High	
Burning kerosene		High
Breath mints	High	
Gasoline vapor	Low	Low
Burning grass	Low-High	Low
Burning gas	Low	
Green smoke	Low	Low-High
Break-free oil	Low	
Ammonia	Very High	

Radiological

Use the AN/PDR-27-series to decide if any contamination remains. If there is contamination remaining, determine the intensity of the contamination inside and outside of the vehicle. If the contamination has an intensity greater than 0.33 cGy (the negligible risk), the vehicle is recycled to station 1.

Recycle Criteria

The COC, together with the CBR officer, will establish the recycle criteria before the start of decon operations. The recycle criteria decides which vehicles return to station 1 after contamination is detected at station 5. If the unit has sufficient time and resources, any vehicle having more contamination than a negligible risk should be recycled. However, time and resources are usually limited and not all vehicles can be recycled. The recycle criteria is based on the weathering effects.

DED Configurations

Decon teams, establishing thorough decon sites, may vary because of organizational and equipment

differences. This section describes the optimum setup configuration. The optimum configuration provides the maximum output for decon teams at 100 percent personnel and equipment. The equipment and personnel requirements for the optimum configuration are identified for both the decon team and supported company augments.

ALTERNATE LAYOUT PLANNING CONSIDERATIONS.— The CBR officer uses METT-T to determine the best possible DED layout for executing the mission. When determining alternate DED layouts, you should apply the following guidelines:

- Retain the ability to spray hot, soapy water or steam under pressure at station 1.
- Station 2 requires the largest number of persons.
- Experienced and qualified CAM operators are required at station 5.
- Water does not have to be hot to rise off DS2; however, the lower the water pressure, the more water required for the rinse.

DECON TEAM EQUIPPED WITH AN M12A1 PDDA.— The optimum setup of a DED for a M12A1 PDDA-equipped decon platoon requires the use of all authorized equipment and personnel (fig. 6-8).

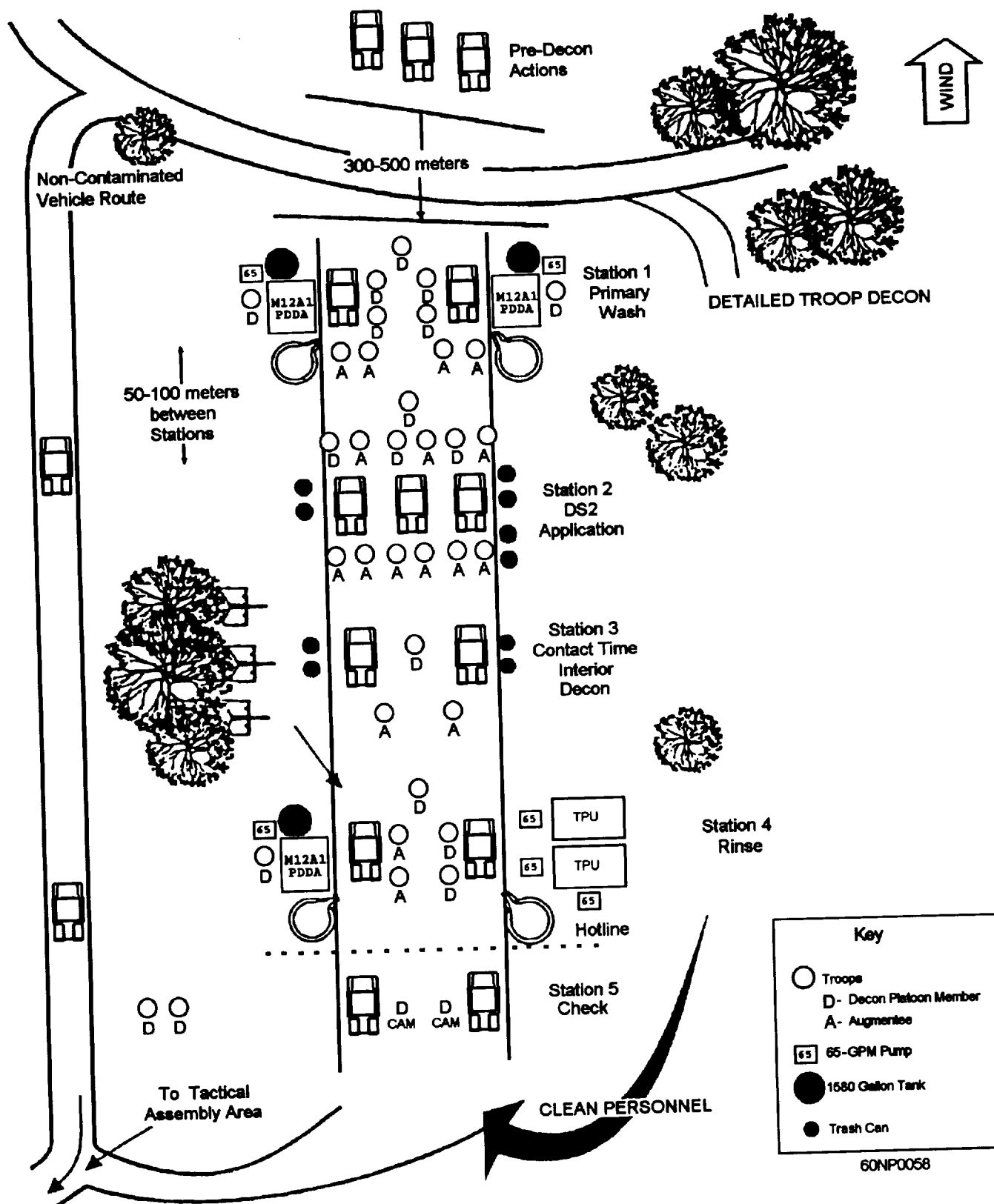


Figure 6-8.—Optimum DED for an M12A1 PDDA-equipped layout.

While this DED configuration is manpower and equipment intensive (table 6-8), it provides for the rapid decontamination of vehicles and equipment (eight vehicles processed per hour).

WARNING

This layout uses dual lanes at stations 1, 4, and 5 to process two vehicles at once. Since the most time and labor-intensive work takes place at station the 3, this station is designed to process three vehicles at a time. The processing rate of this configuration mission will be affected by any work/rest cycle

Work/rest tables are found in appendix VI. Chemical unit leaders must consider the impact of the work/rest cycle on the ability of their operation to process vehicles through DED. Failure to initiate a work/rest cycle could result in heat casualties and failure.

Table 6-8.—Optimum M12A1 PDDA-Equipped DED Setup

Station	Decon Personnel	Augments	Equipment
Station 1 Initial Wash	1 sqd 1 dr 2 PDA op 4 sprayers	4 scrubbers	2 M12A1 PDDAs 2 3,000-gal tanks 2 65-gpm pumps 6 long-handled brushes 8 TAP aprons Liquid detergent
Station 2 DS2 Application	1 sqd 1 dr 3 applicers	9 applicers	18 long-handled brushes 9 mops w/extra mop heads 3 30-gal containers 9 M13 DAPs Sufficient DS2
Station 3 Wait/Interior/Decon	1 POIC	2 assistants	2 AN/PDR 27 3 TAP aprons 6 30-gal containers 10 M8 detector paper 30 sponges 8 M256A1 50 trash bags 1 clipboard w/pen 1 stopwatch
Station 4 Rinse	1 sqd 1 dr 1 PDDA op 2 pump op	2 sprayers	1 M12A1 PDAA 1 3,000 gal tank 3 65-gpm pumps 2 TPU 2 TAP aprons
Station 5 Check	2 Assistance Plt Cdr/CAM op		2 CAM 10 M256A1 20 M8 detector paper 2 AN/PDR 27 2 M8A1 chem alarms
C2	1 Assistance Plt/Cdr 1 Plt Cdr		1 Hummwv/CUCV w/radio 3 NBC marking kits
Total Personnel	20	17	

While this DED configuration is manpower and equipment intensive, it provides for the rapid decontamination of vehicles and equipment (eight vehicles processed per hour) (table 6-9).



Table 6-9.—Optimum M17 LDS-Equipped DED Setup

Station	Decon Personnel	Augments	Equipment
Station 1 Initial Wash	1 sqd l dr 4 sprayers 2 scrubbers	2 scrubbers	3 M17 LDS 2 1,500-gal tanks 3 65-gpm pumps 6 long-handled brushes 8 TAP aprons Liquid detergent
Station 2 DS2 Application	1 sqd l dr 3 applicators	9 applicators	18 long-handled brushes 9 mops w/extra mop heads 3 30-gal containers 9 M13 DAPs Sufficient DS2
Station 3 Wait/Interior/Decon	1 POIC 2 assistants		2 AN/PDR 27 3 TAP aprons 6 30-gal containers 10 M8 detector paper 30 sponges 8 M256A1 50 trash bags 1 clipboard w/pen 1 stopwatch
Station 4 Rinse	1 sqd l dr 4 sprayers		3 M17 LDS 3 1,500 gal tank 3 65-gpm pumps 4 TAP aprons
Station 5 Check	2 Assistance Plt Cdr/CAM op		2 CAM 10 M256A1 20 M8 detector paper 2 AN/PDR 27 2 M8A1 chem alarms
C2	1 Assistance Plt/Cdr 1 Plt Cdr		1 Hummww/CUCV w/radio 3 NBC marking kits
Total Personnel	23	11	

This layout uses dual lanes at stations 1,4, and 5 to process two vehicles at once. Since the most time and labor intensive work takes place at station 3, this station is designed to process three vehicles at a time. The processing rate of this configuration will be affected by any work/rest cycle.

DETAILED EQUIPMENT DECON SUMMARY

ALFA company is normally responsible for the setup, the operation, and the closure of the DED portion of the thorough decon operation. The COC will select the DED site. The DED for chemical and biological contamination consists of five stations:

1. Station 1—Initial Wash

2. Station 2—DS2 Application

3. Station 3—Wait/Interior Decon

4. Station 4—Rinse

5. Station 5—Check

DED configurations may vary because of organizational and equipment differences. The optimum configuration provides the maximum output for decon teams at 100 percent personnel and equipment. The setup for a DED equipped with a M12A1 is different from one equipped with a M17. Both the DED and the DTD must be properly closed and marked. Once closed, an NBC 4 report must be sent to higher headquarters.

CLEARING THE THOROUGH DECON SITE

Once all vehicles and personnel from the contaminated unit have been processed through the thorough decon site, the site can be closed. The COC will ensure that all contaminated elements have been processed.

The decon team closes the DED first. Once the DED is closed, the decon team processes through the DTD. After the decon team has processed through the DTD, the DTD is then closed. Once the DTD is closed, the decon team marks the area as a contaminated area and reports its exact location to the COC. The COC informs higher headquarters using an NBC 4 report.

Closing the Detailed Equipment Decon Area

The DED is closed in sequence, starting at station 1. All vehicles, equipment, and nonexpendable supplies are inspected for contamination. If contamination is found, it is decontaminated. The actions at each station are described below.

- **Station 1—Initial Wash.** Spray all vehicles and equipment with hot, soapy water to remove any contamination that could have been transferred during initial wash operations. Drain the water billets or fabric tanks of water. Inspect all equipment and vehicles for contamination, using the appropriate detection equipment. If no contamination is detected, load the equipment on the vehicles. Spread one can of STB into each sump and then cover the sumps. Post NBC hazard markers near the covered sumps.

- **Station 2—DS2 Application.** Throw mops and brushes used in applying DS2 into a sump or bury them. Load unused cans of DS2 and M13 DAPs on a vehicle.

- **Station 3—Wait/Interior Decon.** Inspect any unused supplies and equipment for contamination. If no contamination is detected, load the equipment and supplies on a vehicle. Throw contaminated supplies into the nearest sump.

- **Station 4—Rinse.** Spray all vehicles and equipment with hot, soapy water to remove any contamination that could have been transferred during

rinse. Drain the water billets or fabric tanks of water. Inspect all equipment and vehicles for contamination, using the appropriate detection equipment. If no contamination is detected, load the equipment on the vehicles. Spread one can of STB into each sump and then cover the sumps. Post NBC hazard markers near the covered sumps.

NOTE: While DS2 destroys the chemical agents, some by-products created are also toxic.

- **Station 5—Monitor.** Check all the equipment for contamination. If it is not contaminated, load it on a vehicle. If it is contaminated, then decontaminate it. Throw contaminated supplies into the nearest sump.

Move all the vehicles just upwind of station 5 and inspect them again for contamination. If any contamination is detected, the crew will use M1 or M13 DAPs to decontaminate the identified areas. Once the vehicles are decontaminated, all personnel will proceed to the DTD.

Closing the Detailed Troop Decon Area

Once all personnel from the DED have been processed through the DTD, the DTD may be closed. After the last person has exited the DTD, the following steps for closing the DTD are as follows:

- Pickup all used supplies from station 7 and put them in the station 7 sump. Pickup the contamination control line. If tape was used, dispose of it in station 7 sump.

- Move all usable supplies and equipment from all the stations to station 1. Discard unusable supplies from stations 5, 4, and 3 into station 1 sump.

- Decontaminate all supplies and equipment collected at station 1, using the decontaminant and rinse water at station 1. Empty the rinse and decontaminant containers from station 1 into the sump.

- Mark the entire decon area. Remove the overgarments using the MOPP gear exchange technique and dispose of the overgarments in the sump at station 1.

- Move any equipment used to fill the sump upwind of the decon area. Decontaminate the rubber gloves and move all the equipment and supplies in station 1 upwind of the decon area. Keep this equipment and supplies separate from that used to fill the sump.

- Your overboots and gloves may now be contaminated. Remove them. Dig a hole and bury them. Mark the hole and/or area.

